June 1928

Electrical Manufacturing

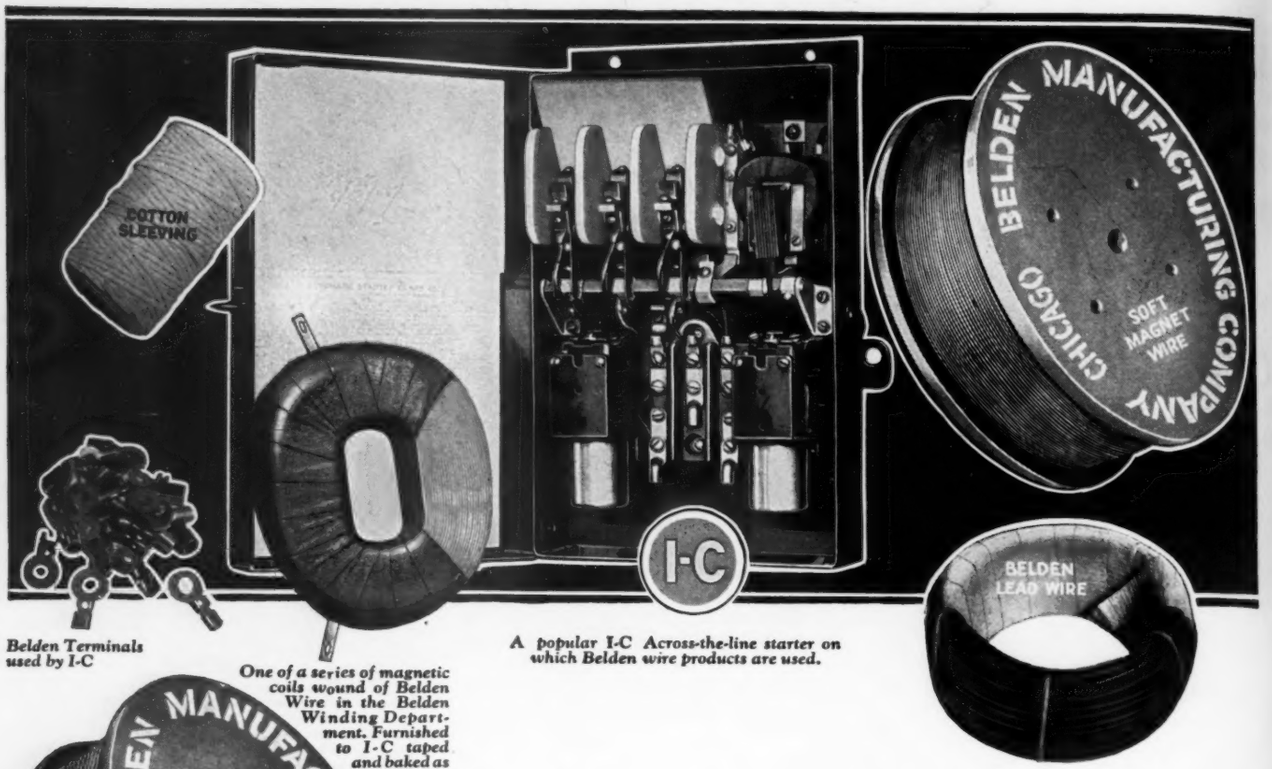
Vol. 1 A Gage Publication No. 3

The modern electric motor offers few opportunities for improvement either electrical or mechanical.

BALL AND ROLLER
PRECISION BEARINGS

The one immediate possibility for all-around betterment lies in the adoption of better bearings.

NORMA-HOFFMANN BEARINGS CORPORATION
Stamford, Conn., U.S.A.



Belden Terminals used by I-C

One of a series of magnetic coils wound of Belden Wire in the Belden Winding Department. Furnished to I-C taped and baked as illustrated.

A popular I-C Across-the-line starter on which Belden wire products are used.

A Complete Wire Service for Industrial Controller Co.

"Specify Belden" is a *buy* word of the Industrial Controller Company that has consistently helped maintain the I-C reputation for reliability in their extensive line of electrical control apparatus.

Magnet Wire, Lead Wire—both Bare Stranded and Insulated, Coil Windings, Terminals, and Cotton Sleeving are a few of the Belden items they use in big quantities.

Industrial Controller Engineers appreciate the uniformly high quality of Belden Products. Their purchasing department finds the Belden Complete Wire Service both convenient and economical.

Standardize on Belden materials and secure these advantages for yourself. Utilize the extensive experience of the Belden Engineering Staff. It is yours for the asking.

Write for complete information.

Belden Manufacturing Company

2310-B South Western Avenue **Chicago, Illinois**

BELDEN PRODUCTS

Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold (Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

Specify Belden

Attentionless Electric Motors

Once installed, Timken-equipped motors become permanent, attentionless units in your plant. You could forget them, aside from a little lubrication once every few months. Thousands of Timken-equipped motors have given years of such service—many of them on jobs where bearing life was previously limited to months.

Timken Bearings constantly maintain the original gap, without constant attention. Rubbing, burn-outs and shut-downs for motor trouble are eliminated. Dripping becomes a thing of the past. Endurance, dependability, economy, exceed anything ever known.

In respect to bearings any Timken-equipped motor is ready for any conditions! Floor, wall or ceiling mountings make no difference. Type of drive makes no difference. *For load direction makes no difference.* All combinations of radial and thrust loads are equally well provided for by the Timken taper principle.

So much more than merely anti-friction bearings, Timkens are improving motor operating and cost records, just as they are doing in every type of equipment throughout Industry. Savings are so great in many cases that it pays to write off obsolescent motors immediately, installing modern Timken-equipped types. Leading motor manufacturers can supply you.

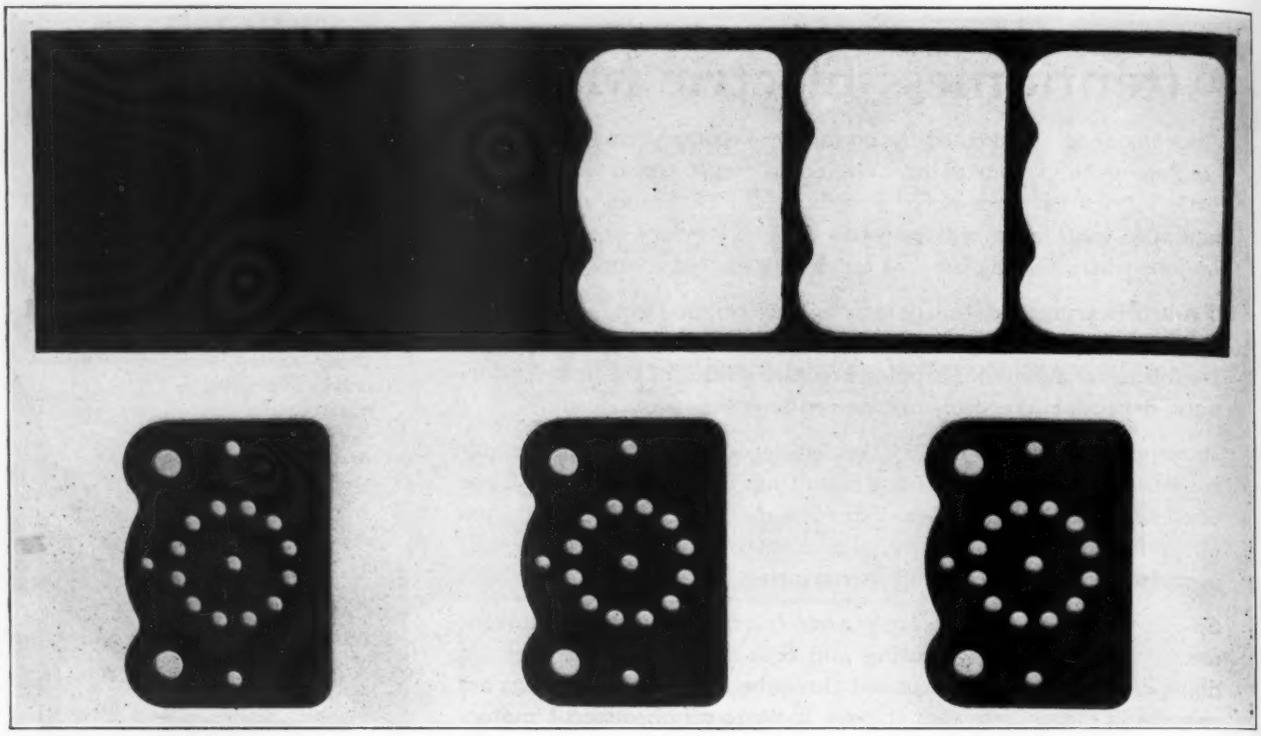
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

Timkens are more than anti-friction bearings because they have the extreme all-around capacity made possible only by Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel.

SINGLE ROW TIMKEN BEARING

DOUBLE ROW SELF-CONTAINED TIMKEN BEARING

TIMKEN
Tapered
ROLLER BEARINGS



Formica that Shears and Punches Cold!

IMPROVEMENT in the punching grades of Formica have now made it practical to shear the stock cold, and punch it cold up to and including 3/32 thick.

It can be had in natural, brown or black colors.

This unusual workability has been attained in a stock that has been fully cured. It has much better insulating ability than any stock with like working qualities that has ever been available before.

There is no increase in price for this material. If you would like a sample to try on your punch press and shear . . write us.

THE FORMICA INSULATION COMPANY

4638 Spring Grove Avenue Cincinnati, O.

FORMICA

Made from Anhydrous Bakelite Resins

SHEETS TUBES RODS

Electrical Manufacturing

Reg. U. S. Patent Office

• Production • Marketing • Administration • Repairing •

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Volume 1 | JUNE, 1928 | Number 3

Contents of This Issue

The New Spirit of Business.....*Stanley A. Dennis* 105
Teamwork for Lower Production Costs..*C. S. Ching* 106
Mounting Motors and Control on Machines..... 109
How Industry Buys Electrical Equipment..... *R. O. Eastman* 112
The Benefits of Training Shop Men..... *H. L. Hildenbrand* 116
Action Demanded Along Entire Sales Line..... *J. E. Davidson* 118
What NEMA Sections Have Accomplished..... 119
Leaders of NEMA Sections..... 121
Applying Insulating Materials ..... *D. H. Braymer and A. C. Roe* 125
Characteristics Determining Motor Selection..... *Theo. Schou and C. P. Robinson* 128
Editorials 132
Marketing Systems—Part II....*John Allen Murphy* 134
News of the Month..... 137
What's NEMA Doing?..... 141
Refrigerator Manufacturers Plan an Association... 142
How Electric Welding Effects Plant Economies..... 143
Achieving Quality Repair Work.....*H. L. Holcomb* 144
Nickel—Its Electrical Uses..*Wm. Crawford Hirsch* 147
Reviving Handicraft Skill.....*F. A. Westbrook* 149
The Exposition at Barcelona in 1929..... 151
Facts, Figures and Trends..... 152
Auto-Starter Components 153
New Goods for the Buyer's Inspection..... 155
Index of Raw Materials, Parts, Electrical Equipment 157

Manufacturers Show Extensive Lines

E. W. GOLDSCHMIDT of the Wagner Electric Company, New York was chairman of the committee which had charge of the electrical exposition held on Young's Million Dollar Pier, Atlantic City, June 4-9, in conjunction with the 51st convention of the National Electric Light Association. The exhibition surpassed all previous shows in the 21 years of the Exhibition Committee's existence. Every inch of the 81,860 square feet of exhibition space was filled, and more than 200 manufacturers exhibited comprehensive displays of electrical apparatus and merchandise. The exhibition was much larger than in 1927, when 75,057 square feet of space were available, and when the number of exhibitors was 194.

E. W. Goldschmidt

The secretary-treasurer of the Exhibition Committee which acted under the chairmanship of Mr. Goldschmidt was Frank H. Gale of the General Electric Company, Schenectady, N. Y.

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461 Eighth Avenue, New York, N. Y.

Chicago Office: 1742 Monadnock Block, L. C. Bassett, *Manager* | Cleveland Office: 501 Caxton building, Harry Krohn, *Manager*

Deltabeston

"THE WIRE WITH THE LONG ASBESTOS FIBRE"

ELECTRIC RANGES

STAGE LIGHTS

ELECTRIC HEATERS

HOUSEHOLD APPLIANCES

LIGHTING FIXTURES

MOTORS

DELTABESTON is a very flexible conductor with a covering of long-fibered asbestos. This makes an unusually tough insulation that will not tear, open up, burn or break down under the severest strain.

For the benefit of your product's consistent performance, it should be equipped with Deltabeston; it is the wire that leaves no weak spots, and marks a high quality product "SAFE"!

A few tests will give you the Deltabeston idea, and a sample will be gladly sent you.

Resists Water

DELTABESTON WIRE

Resists Heat

YORK INSULATED WIRE WORKS

OF GENERAL ELECTRIC CO.

120 BROADWAY, NEW YORK

GAIR CASES

CORRUGATED & SOLID FIBRE

Gair centralized, self contained Mill and Corrugated Case Plant, New London, Conn.

GAIR

CORRUGATED SHIPPING CASES

WE LIVE AND WORK IN A REALM OF CORRUGATED SHIPPING CASES DURING ALL THE PRODUCTIVE HOURS THERE ARE.

THE GAIR ORGANIZATION IS BANDED IN A PLOT TO MANUFACTURE RIGHT AND SERVE QUICKLY. IT MAKES ITS GAIR CORRUGATED CASES STAUNCH, CORRECT IN LINE AND WITH CHARACTER PRINTING. IT BUILDS THEM FOR HEAVY DUTY AND RESPECTABLE ARRIVAL. IF WE SEEM TO PUSH THE MERITS OF GAIR CORRUGATED CASES OVERMUCH, PLEASE SEE WHAT OTHERS SAY:

ATWATER KENT MANUFACTURING COMPANY
SCIENTIFIC AUTOMOTIVE EQUIPMENT
RADIO APPARATUS
4700 WISSAHICKON AVE.
Philadelphia

A. ATWATER KENT
President and Treasurer

May 23
1928

Robert Gair Company,
Graybar Building,
New York, N. Y.

Gentlemen:

In placing our business with you again for the coming season, we wish to repeat that we have found your containers satisfactory in every respect.

We believe that the packing of our House Current Radio Set embodies all the problems confronting shippers of nearly all products. Protection of delicate parts adjusted to absolute accuracy, finish of cabinet, cushioning of weight, protection against moisture and tampering in transit, appearance of package and other features must be considered, and we can frankly say that Gair Corrugated Containers have amply met all these conditions and carried Atwater Kent Radio Sets and Speakers safely to all parts of this country and abroad.

Another pleasing point, is that your containers are made repeatedly to our exact specifications, a feature that is very necessary in production so large as ours.

Respectfully yours,
ATWATER KENT MANUFACTURING COMPANY,
Packing Department,
H. L. Kurtz

HLK/MLC

Corrugated Cases *for* National Distribution

ROBERT GAIR COMPANY

420 LEXINGTON AVENUE · NEW YORK CITY

Six Box Board Mills. 1200 tons daily

Container and Carton Sales Offices:

NEW YORK CITY
Robert Gair Company
Graybar Bldg.
420 Lexington Ave.

BOSTON, MASS.
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Rice Bldg.
No. 10 High St.

PHILADELPHIA, PA.
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BUFFALO, N. Y.
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No. 228 No. La Salle St.

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Graybar Bldg.
420 Lexington Ave.

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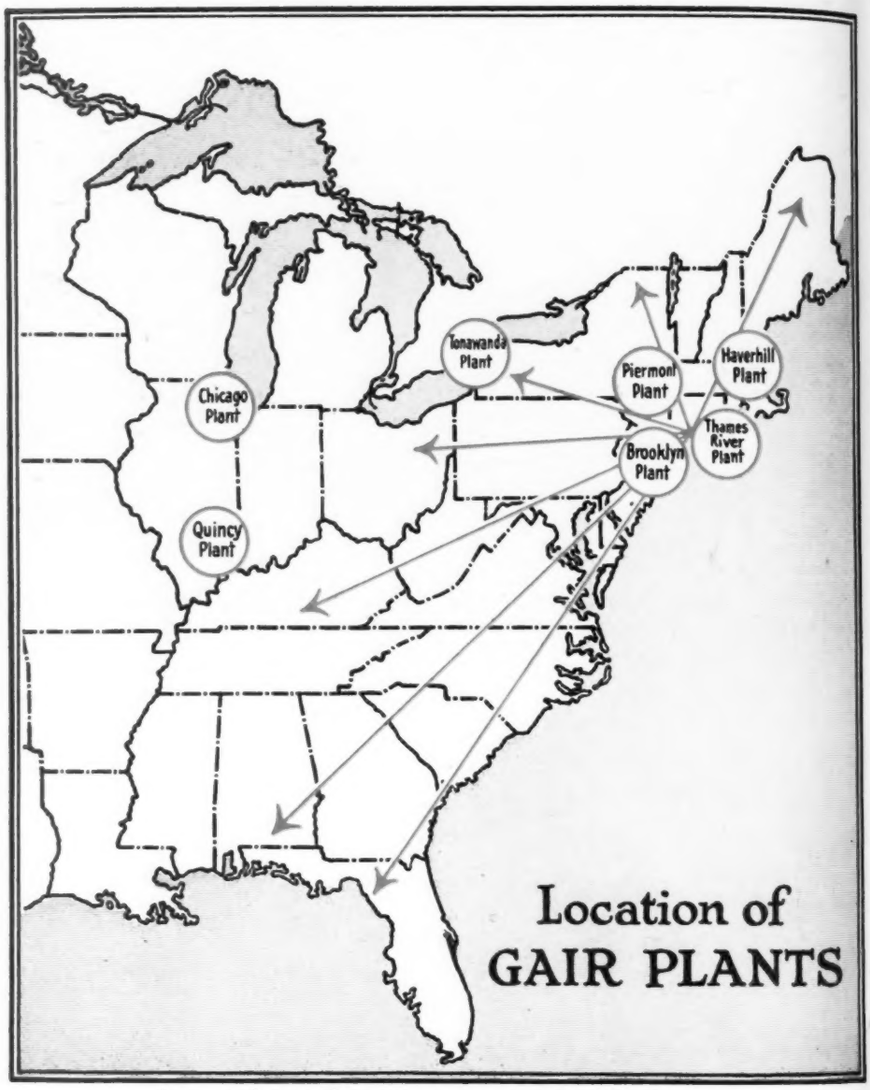


Arrows indicate Robert Gair Company's field of distribution in Corrugated Cases and Fibre Containers

DISTRIBUTION

THIS map shows the area of distribution of Corrugated Cases from the Thames River Division, New London, Conn., and of Solid Fibre Containers from the Piermont Division at Piermont, N. Y.

Gair Mills at Haverhill, Mass., Tonawanda, N. Y., Chicago, Ill., and Quincy, Ill., concentrate upon Box Board Products. If all Gair paper-making machines were battalioned single file, they would trail over about a mile. Altogether, they are equal to an output of somewhat more than twelve hundred tons daily.

PACKAGERY ENGINEERS

GAIR consultants are trained in packing-room principles. Some have had mill experience; all are students of their business. Notice to the General Office in New York or any of the Company's Branch Offices will be answered by them quickly and with the earnest purpose of making their visit resultful to you.

These Consulting Engineers are supported by J. D. Malcolmson, graduate of the University of Kansas in Chemical Industrial Engineering and former Fellow of the Mellon Institute of Industrial Research of the University of Pittsburgh. He is an authority on legal regulations and manufacturing technique. He is in charge of research and of special construction in our Department of Design.

ROBERT GAIR COMPANY

GRAYBAR BLDG., 420 LEXINGTON AVE., NEW YORK CITY

Universally Specified by Electrical Engineers Everywhere

Through its resources in plants, equipment and experience Dudlo has become known as the world's master producer of Magnet Wire and Coils. It is considered the preferred source of supply by the leading manufacturers.

Every electrical engineer and manufacturer knows that there *is* a *big* difference in magnet wire. Regardless of size or type of insulation, the *best* is *always* the cheapest in the end. No electrical product is any better than the wire used in its coils.

All Dudlo wire is drawn from the finest pure copper rod—insulated with the very best materials—produced, inspected and tested by highly-skilled workers, resulting in a product of unequalled quality from every standpoint—physical, chemical and electrical.

The plant illustrated above is the largest in the world devoted exclusively to Magnet Wire and Coils.

Dudlo Magnet Wire is Used by Thousands of Manufacturers of

- Small Motors for every purpose
- Radio, Radio Parts and Accessories
- Automobile Starting, Lighting and Ignition Systems
- Automobile Horns
- Telephones
- Electric Meters
- Transformers
- Electric Bells
- Violet Ray and X-Ray Apparatus
- And many other Electrical Products.

DUDLO

DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

56 EARL ST. NEWARK, N. J. 160 N. LA SALLE ST. CHICAGO, ILL. Division of THE GENERAL CABLE CORPORATION 274 BRANNAN ST. SAN FRANCISCO, CAL. 4153 BINGHAM AVE. ST. LOUIS, MO.

You expect these—

strength
finish and
uniformity

in your moldings!

—in natural black and colors

THE proposition of producing a plastic possessing as its prime characteristic "*great mechanical strength,*" was handed to our laboratory about one year ago.

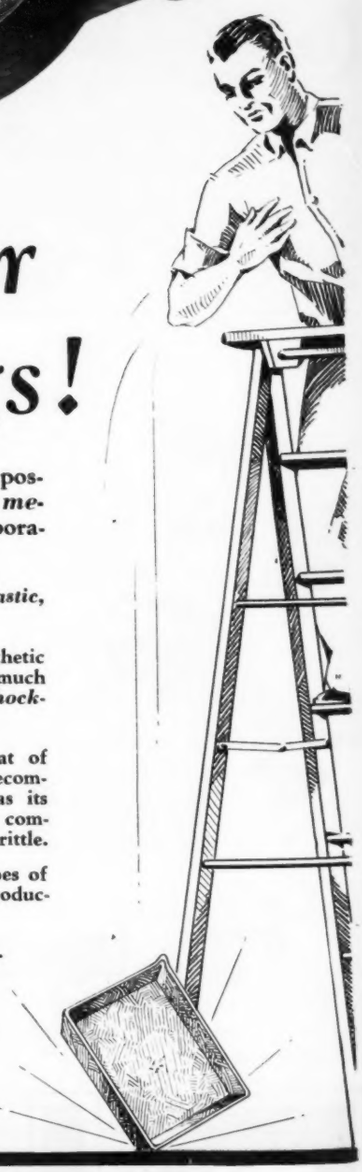
The result — *a really shock-proof plastic,* HERCULITE.

This material is as favorably economical as synthetic molding compounds with the addition of those much desired features — *mechanical strength and shock-resistant qualities.*

The flowing point of HERCULITE is below that of other molding compounds and is, therefore, not recommended for moldings of intricate design, but has its individual advantages for moldings where the usual compounds lacked strength or were found to be too brittle.

HERCULITE is admirably adaptable for many types of molding jobs and it will, most certainly, lower production costs for the electrical manufacturer.

State your molding problem and we will immediately advance the answer.

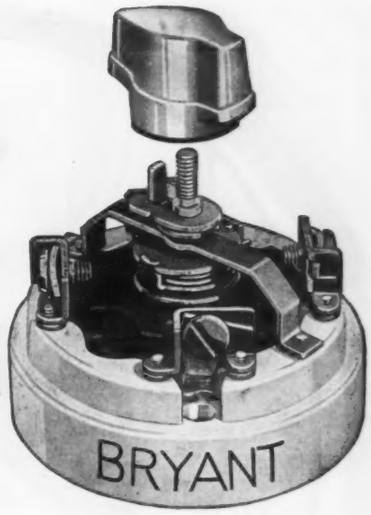


The Colasta Co.
Hoosick Falls, N. Y.

HERCULITE
—an unusual resinoid of superior strength

These → Bryant Heater and Motor Control Switches

BRYANT
SUPERIOR WIRING DEVICES



HEATER SWITCH
No. 6279
[Less cover]

A few of over three thousand "Superior Wiring Devices" listed in our Catalog

"New Wrinkle" Sockets
"Perkins" Switches
"Pyrotite" Fuse Plugs
"Uno" Shade-Holders
"Wrinklet" Sockets
"Yankee" Switches
"Spartan" Receptacles
"Titan" Sockets
"Brylock" Locking feature for Lamp Sockets
"D.D." [Disappearing Door] Receptacles and Plugs
"Dubl-Duty" Two-way Sockets
"Elexit" Devices
"Junior" Rosettes
"Perma" Finish for Flush Plates
"Spar-Tap" Two-way Sockets
"Undark" Luminous Pendants and Inserts
"Glo-Guide" Luminous Switches
"De Luxe" Wood Inlaid Flush Plates
"Templus" Composition Plates, Plugs, Switch and Receptacle Bodies
"Dugle" Two Circuit Single Gang Flush Switches
"Trigle" Three Circuit Single Gang Flush Switches
"Ripple" Attachment Plug Caps

are of interest to manufacturers of electric ranges, water heaters, table stoves, etc., and to the builders of motor driven machinery requiring positive motor control.

HEATER SWITCH No. 6279

.... a single pole, series parallel three-heat-and-off switch of reversible action. Built to the rigid Bryant standards, it will give positive heat control over a long period of service and resistance to possible over loads. No. 6279 is of standard Bryant design though special types are provided to meet unusual needs.

EXPULSION TYPE SURFACE SWITCH
No. 782

.... this new switch was designed especially for inductive loads in 3-phase motor control up to 2-h. p.

An unusually well made switch of great strength and positive action. Two covers are available -- pressed steel or cast iron - each dust proof.

In factories, textile and flour mills, this switch will prove its super-qualities.

EXPULSION TYPE SURFACE SWITCH
No. 782 for Motor Control
[Less cover]

Write for a copy of this catalog

THE BRYANT ELECTRIC COMPANY
BRIDGEPORT, CONNECTICUT

NEW YORK PHILADELPHIA CHICAGO SAN FRANCISCO

A SUPERIOR WIRING DEVICE *for* EVERY ELECTRICAL NEED

CRA
hasn
into a
40 y

RANTON

moulded itself all industries in years of service

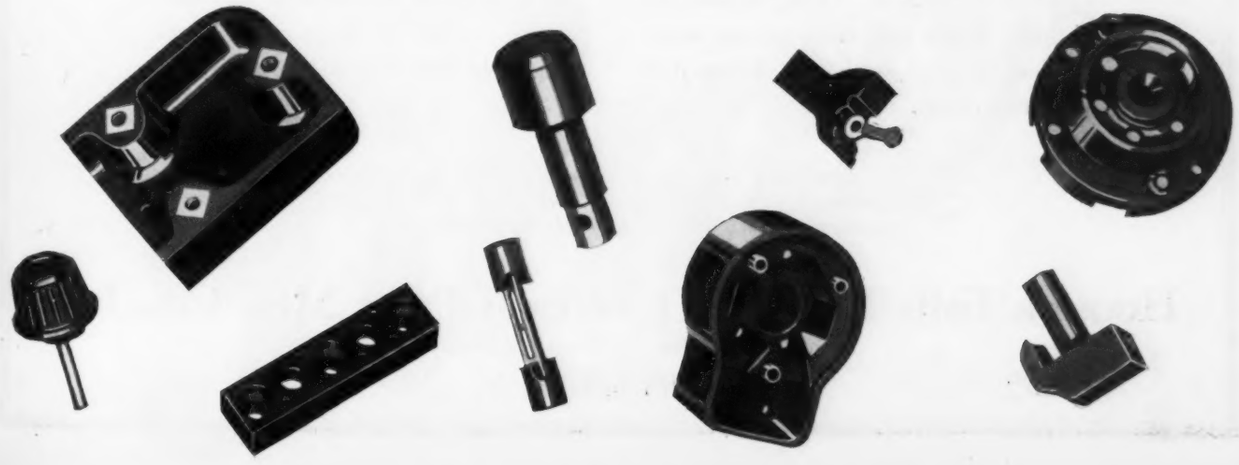
From moulds to finished casting Scranton Button Moulding has gained a high reputation for uniformity, accuracy and finish. In Bakelite, "PHENOLIC" or "LACANITE" Scranton insulation is decidedly better.

SCRANTON MOULDS retained by them are always repaired, insured and renewed, if necessary, without additional expense.

THE SCRANTON BUTTON CO.

Plants located at SCRANTON, PA., *and* AUBURN, N. Y.

NEW YORK OFFICE—50 *Union Square.* CHICAGO CLEVELAND



Plugs and Cord Sets

that give service —and then some!

For Heaters, Toasters, Table Stoves, Percolators, Waffle Molds, Curling Irons, Irons, Fans, Soldering Irons, Drink Mixers, Hair Dryers, Lamps, Violet Ray Outfits, etc.

HOOSICK FALLS cord sets, appliance and attachment plugs are conspicuous by their absence of trouble. Cheap accessories look cheap and only attract attention to your appliances when they break down.

You can always be sure of Hoosick Falls plugs and cord sets being worthy of the finest appliance, both in appearance and efficiency. And their prices are remarkably low for such quality.

You'll do well to get samples and quotations from us—your appliances will be better sellers equipped with Hoosick Falls accessories.

Hoosick Falls Radio & Electrical Parts Mfg. Co., Inc.

Moulded Parts of Quality Insulation

Hoosick Falls, N. Y.

Geared to low replacement costs

Cross section of pulley showing the manner in which the Gilmer V-type moulded rubber and cord belt grips the pulley walls with its entire side surfaces.

Gilmer V-type moulded rubber and cord belts outwear the ordinary V-belt not only because they are scientifically made of the finest materials but because they are ***tailored*** to ***fit*** the ***pulley.***

The entire side surfaces grip the pulley walls with bulldog stubbornness. They have an amazingly long life because wear is ***equal*** on all parts of the side surfaces. Friction due to slipping—chief cause of wear —is absolutely minimized.

Gilmer V-belts are put to the most rigorous factory tests, and never yet has one failed to outwear a V-belt of any other make.

Send for Folder "E" which fully describes Gilmer construction and mould sizes which are now available.

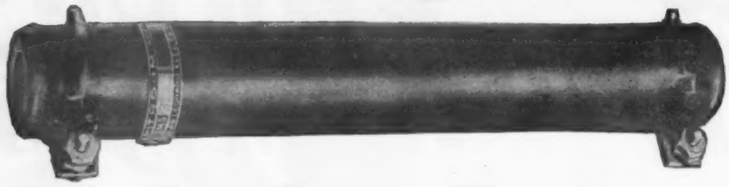
L. H. GILMER CO. Tacony, Phila., Pa.

Gilmer

. . . quality belts for more than a quarter of a century

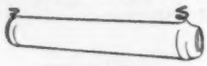
VITROHM RESISTORS · · · IN EVERY INDUSTRY · · · IN EVERY LAND

VITROHM

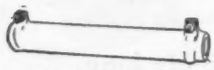


Is the Mark of an Engineering and Production Service

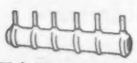
TERMINALS & MOUNTINGS



Wire Terminals

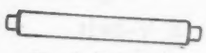


Screw Terminals

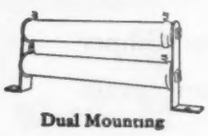


Tab Terminals [1]

Tab Terminals [2]

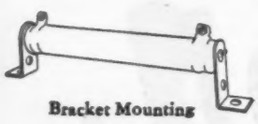


Ferrule Terminals



Dual Mounting

Cage Mounting



Bracket Mounting

Plug-Receptacle Mounting

These illustrations show some of the standard terminals and mountings for Vitrohm Resistors. Bulletin 63 gives full descriptions.

VITROHM RESISTORS* have not, like Topsy, just "g r o w e d." They represent a logical and carefully engineered product developed from the first vitreous enamelled resistors made by WARD LEONARD some 36 years ago.

WARD LEONARD first manufactured the VITROHM RESISTOR in successful answer to the demand for a resistor to be permanently accurate while dissipating more energy than was possible with existing types of bare-wire, composition-covered and carbon resistors.

During these past 36 years, WARD LEONARD has learned a great deal concerning vitreous enamelled resistor units. We learned, for example, that the specific application of a resistor frequently limits its design.

In our development files is listed the design data of more than 46,000 resistors. This data covers resistors for use with every type of electrical device, from generators of the nineties to the radio power pack of today.

This knowledge, including as it does, a wide research and production experience, is yours the moment your specification for a resistor reaches us.

Bulletin 63, sent w i t h o u t charge, describes standard VITROHM RESISTORS. A post card will bring it.

**Vitrohm Resistors:*

Made by winding a special resistance wire upon a refractory base. The resistive element and terminal connections are then completely enclosed and permanently protected by fused-on vitreous enamel. This enamel, which is exclusively WARD LEONARD'S, assures rapid conduction of heat from the resistive element to the air and permits h i g h dissipation of power without overheating or injuring the unit.

WARD LEONARD ELECTRIC CO.

MOUNT VERNON, NEW YORK

38-30-26.

Duro-Chrome
CHARACTERISTICS

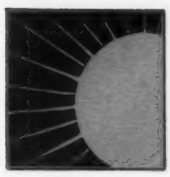
It

will not rust. ❖ is not affected by intense heat. ❖ will not corrode. ❖ will not pit or scale under any conditions. ❖ resists wear. ❖ resists erosion. ❖ resists abrasion and friction. ❖ is not affected by acid fumes. ❖ resists all acids, but hydrochloric and impure sulphuric. ❖ is not affected by alkalies, either hot or cold, diluted or concentrated. ❖ resists the formation of verdigris on copper or brass. ❖ does not tarnish, stain or dim. ❖ is non-toxic. ❖ in a high lustre finish its reflectivity is excelled only slightly by silver newly plated. does not give off a black oxide. ❖ will not peel, crack, chip or blister. ❖ does not affect temper of base metal. does not distort the part plated. ❖ is extremely flexible. ❖ does not perceptibly change weight or dimensions. does not obliterate markings, trade names, etc. ❖ is positive to many metals and tends to alloy with them. is harder than glass. ❖ is the smoothest and most continuous plate known. ❖ has a co-efficient of friction which is so low that practically no substance will stick to it. has lubricating value. ❖ seals in die castings. ❖ covers soldered and welded parts. can be soldered and welded. can be produced with a gray, dull silver, bright or high lustre finish. ❖ has a richer lustre in a bright finish than silver. ❖ can be applied to all common metals and many alloys. ❖ often makes possible the use of a cheaper or more desirable base metal. ❖ permits the use of practically any base metal preferred.

A New Sales Factor

Duro Chrome

THE DURABLE CHROMIUM PLATE



Brilliancy

Duro-Chrome will not tarnish. It has a luster that will never dim—a surface that will last indefinitely

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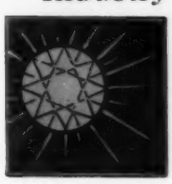

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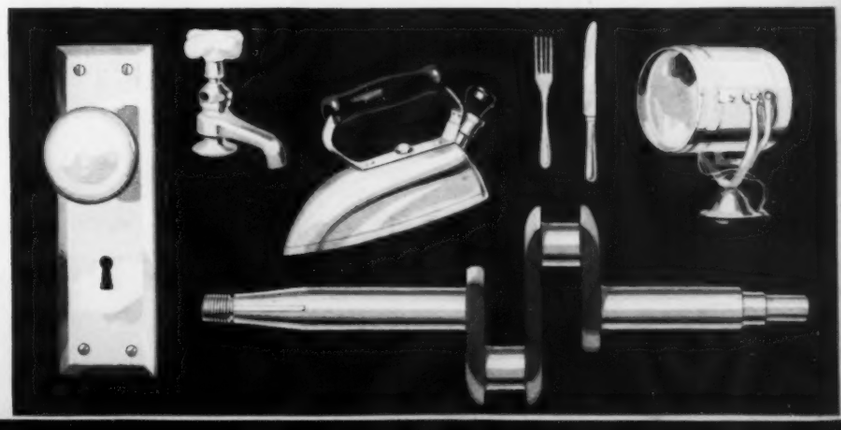

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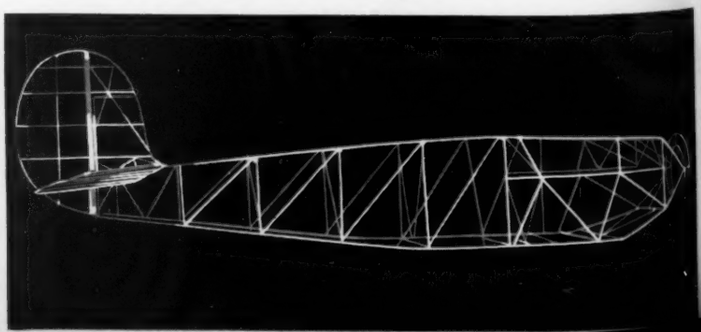

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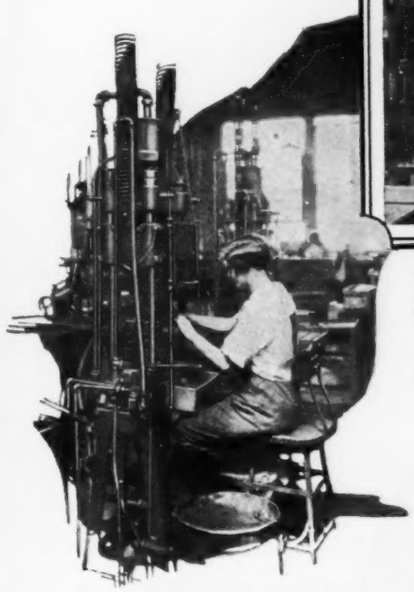
A production aisle in the hot-molded department. Note that the most modern equipment is used to decrease manufacturing costs by scientific mass production



This trained operator molds thousands of intricate pieces every day. Hundreds of such operators are needed to meet the demand for G-E Textolite Molded

An aisle in the cleaning department. After cleaning, the beautiful polished pieces are ready for packing

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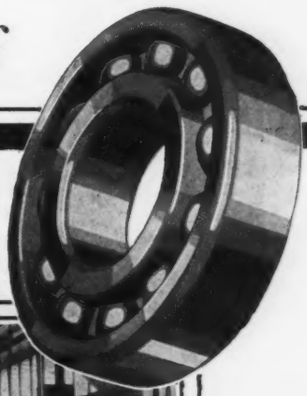

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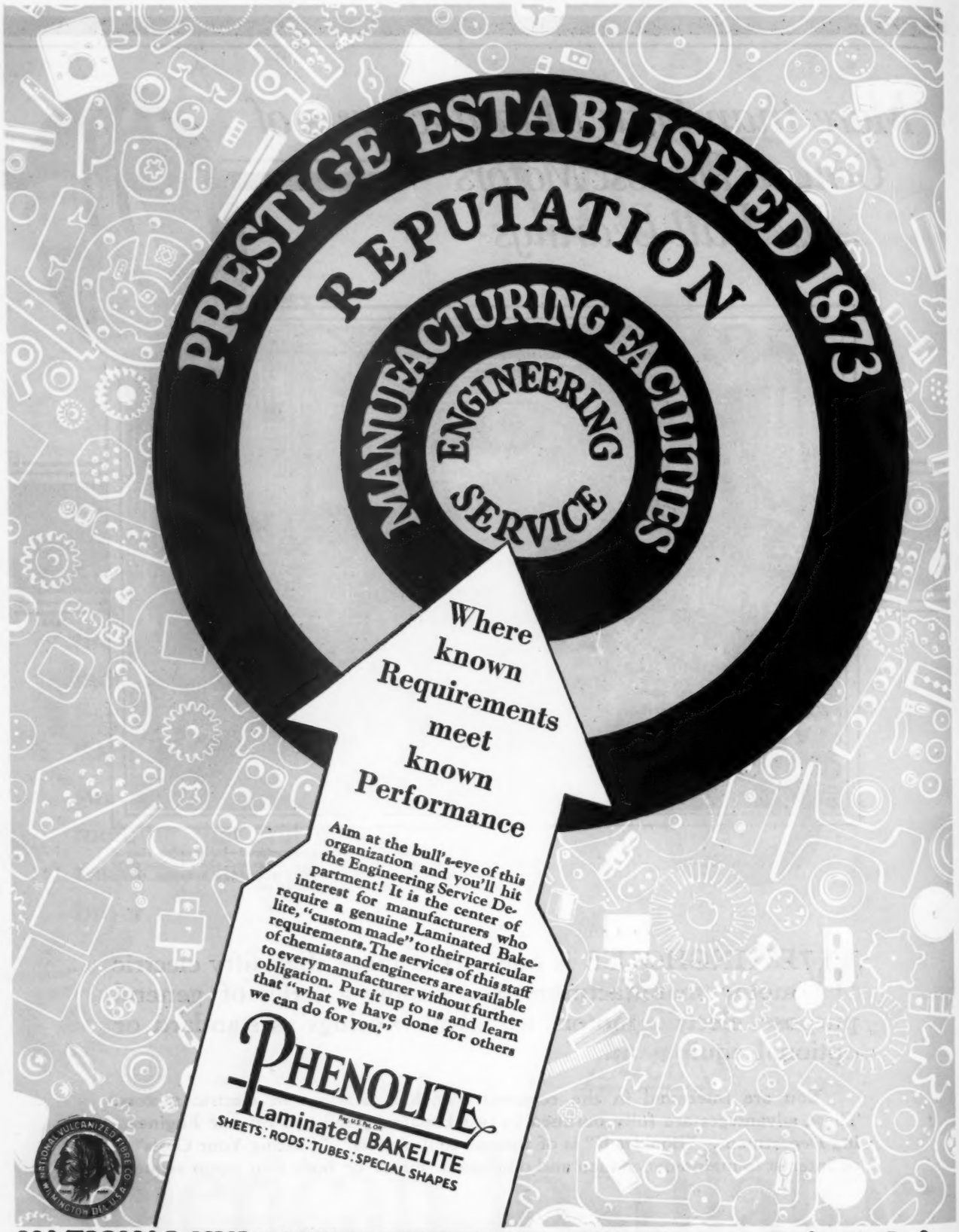
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The NEW SPIRIT of BUSINESS

By JOHN H. PUELICHER

President, Marshall and Ilsley Bank, Milwaukee

AMERICA, in the last two decades, has achieved a rather outstanding business morality. In these two decades business and service have become almost synonymous. There was a time when "The public be damned" and "Charge what the traffic will bear" were accepted business principles, and these are illustrative of others equally accepted. Such principles have today become archaic. The manufacturer of things for sale, rather than for use, is rapidly fading from the picture.

We sometimes speak of business as consisting of an interchange of goods and services, but after all business consists of the interchange of only one thing, and that is service.

The Objectives of Manufacturing

LET us consider a great manufacturer or distributor of a product. What does he do? He not only obligates himself to sell to his customers an honestly constructed product—that is, a product which will physically perform the services to the consumer which he advertises that it will perform, but he also obligates himself—and especially has occupation brought this about—to supply this product to the consumer at a price which will represent only a fair profit to himself. He also obligates himself, somewhat as a public utility company is compelled by law to do, to serve all consumers equally and fairly without discrimination, provided they are able to discharge their side of the transaction of purchase. He also obligates himself to stand behind his product and if any unforeseen failures in its quality develop, to make them good in full to his customer. He also obligates himself, by the very fact that through his advertising he creates first an appetite and then a public need for his product, always to be in a position to supply the demand for his goods.

Maximum Service Is Needed

ALL these things, which are practical competitive factors, are forms of socialized service, and only that business will succeed today which loads its products with the maximum of all these forms of service. Advertising—that is, the public profession of the ability and the willingness to deliver products in the foregoing terms—has created in the United States an era of business that calls for the formulation of even a newer business morality, the morality involved in the obligation to fulfill intrinsically, and not merely superficially, every one of these forms of service of which goods are the vehicle.

Business thus becomes a form of economic service, an essential part of what we term social service, and today any business in the United States which does not perform social service, in this sense, has not long to live.

The new spirit of business is that of a profession—whose formulas spring from scientific research and whose application is dominated by social significance. Good business has gone even further than concerning itself solely with output and returns, finding it better business also to give thought to its human factors. Safety, health, education, profit sharing, and more recently stock ownership, have become the elements receiving much consideration from intelligent business men. Even the nature of competition has changed with this growing business morality. The ruthless slaughter of competitors by fair means, or foul, has been replaced by a competition of greater service.

Teamwork for Lower

Much study, plenty of patience and, above all, honest dealings are necessary for the further development by management of that cooperation with its employees which aids business progress

PROFESSOR THOMAS CARVER in a recent article says: "There are three means of escape from drudgery —slaves, cheap labor and machines. Slaves and cheap labor relieve only the few fortunate ones. They escape by shifting the burden onto the many. The machine is for the multitudes; it will emancipate everyone from drudgery." This statement, in a few well chosen words, gives an accurate summary and explanation of man's industrial progress. In the United States we have experienced these three economic stages. Within the last few years particularly, we have come to understand the wonderful benefits which machines can bring to a people.

I should like, however, to modify the last sentence in Professor Carver's statement so that it will read: "The machine is for the multitudes; it can, if properly used, emancipate everyone from drudgery."

While the machine, with improved methods, holds out this great hope for mankind, our own history, as well as that of other nations, definitely proves that it is only through the correct use of machines that man will be able to obtain this universal emancipation from the drudgery to which he does not have to submit.

¶ Mr. Ching stresses the fact that employee and public good will are assets of immeasurable value to management —a priceless heritage.

¶ That heritage, he holds, by constructive effort, can be made of ever increasing value to any industry and to the nation at large.

¶ The first step toward meeting that responsibility is the continual development of far-sighted policies and practices by management, policies and practices which build up the confidence and good will of the employees in industry.

¶ Mr. Ching's article will be heeded by progressive electrical manufacturers who realize its soundness.

In other words, it is possible for short-sighted industrial leaders to so conduct business that the economic fruits of the machine shall be enjoyed only by the privileged few. When such a policy is adopted, it means that those who control the instruments of production are unwilling for the workers and the general public to receive a proportionate share in the increased output through higher real wages and lower price of commodities.

Opposition to Improved Methods

THIS practice inevitably leads to opposition to improved methods, or what is just as important, it fails to build up that receptive attitude on the part of workers which is absolutely essential if the machines are to be used to advantage. When this condition comes about, the benefits derived from new machines are so small and obtained at such cost that the incentive to introduce new methods is killed.

It is also true that this condition may arise even when management has no such selfish aims. For arbitrary measures and the failure to get employees to understand the general benefits which are possible through labor conservation are just as fatal to industrial progress.

We all know that this is not the situation in this country. In fact, the exact converse is more nearly true. I believe that a more general understanding of this fact, and the constructive recognition of the reasons for it, is of greatest importance to our further industrial progress.

Of late much has been said about our unemployment. Many who should know better have spoken of it as due to our improved methods and the introduction of machinery. According to this theory, labor conservation is not necessarily a blessing, and one who advocates it would first have to justify his position.

The idea that the introduction of new machinery and improved methods throws men out of work is as old as industrial history itself. It would surely seem that the error of this belief has too often been proved for one to waste any time on the subject. One who gives the subject even passing notice should realize that the use of labor-saving machinery and methods is the one thing which has raised man from the mere existence level to economic independence. Those who would limit or restrict it in any way are fighting against industrial progress and striking at the basic cause of our present high standard of living. A manufacturer who neglects it is courting business failure; a nation which forgets or denies its benefits is headed toward industrial stagnation. There is no cause to turn back and every reason to move forward.

To argue otherwise is to follow a strange line of reasoning. If the introduction of the steam shovel takes jobs away from people, then we had better stick to the old-fashioned hand shovel. But even the hand shovel, in its day, was an improvement, and if we are logical, we must also discard that and go back to the still cruder instruments of stone and wood used "When Adam delved and Eve span."

Such reasoning is perfectly sound, and what goes for the steam shovel is equally true of all those sound modern devices by which we attempt to increase production and lighten the load of labor.

Keep an Open Mind Toward Change

YET in spite of this, opposition to improve methods is not something of merely theoretical concern. It is found in varying degrees in most industries and in all nations.

In the United States we have been comparatively free from this opposition, and in its place we have built up a general open-minded attitude toward change and improvement. *This, I believe, is one of the most important factors in our industrial supremacy.*

Our belief in the economic soundness of the conservation

Cost of Production

By C. S. Ching

Supervisor of Industrial Relations, United States Rubber Company.

This article is taken from an address which Mr. Ching, as president of the American Management Association, made before the Chamber of Commerce of the United States on May 9, 1928

IN the United States we have built up a general open-minded attitude toward change and improvement. This is one of the most important factors in our industrial supremacy. Our belief in the economic soundness of the conservation of labor has had an effect upon our industrial progress which is beyond calculation. C. S. CHING

of labor has had an effect upon our nation's industrial progress which is beyond calculation. One of management's greatest responsibilities is so to conduct business that this belief will be daily strengthened. This responsibility becomes even greater when, due to a business recession or tardy economic adjustment, the soundness of this attitude is called in question.

Labor-Saving Devices

OUR present attitude toward labor conservation had an early start in this country because labor, as a factor in production, was scarce when compared to the opportunities offered by our abundant natural resources. We thus became accustomed to the use of labor-saving devices and methods. Our belief in such methods gathered force as time proved its soundness, with the happy result that a receptive attitude toward improved methods has now become a national characteristic.

While conditions in our country were favorable for this attitude toward the introduction of new machinery and improved methods of production, its healthy growth has not been a haphazard one.

All Share in Benefits

IN the past few years we have witnessed an economic revolution in this country which has astonished the whole world, including ourselves. It undoubtedly had its foundation in new machinery and up-to-date methods of production. But we must surely realize that there have been other factors at work. To my mind, the real contributing factor has been the increasing realization on the part of management that we can only obtain the greatest results from the introduction of new methods when the wage earner, management, stockholder and general public share in the benefits derived from the greater output of goods.

The high standard of living of the American wage earner has been commented upon frequently. This fact, though capable of measurement, needs no statistical proof. It is evident on every hand. This and other facts which show the wide spread of our national prosperity are ample evidence of the degree to which our whole population is the gainer through modern methods of manufacture. An examination of our Census of Manufactures, so far back as we have records, shows conclusively that the per capita income of the wage earner has increased in direct proportion to the per capita value of goods produced.

Herein lies that proper use of machinery which is responsible for the open-minded attitude of our people toward change and improvement—an attitude, in turn, which has made possible so great a degree of teamwork in our industrial organizations. It is a fact that makes for progress

that management of industry in this country has a deep appreciation of the value of improved methods. But it also understands that the attitude of the worker toward machines and toward improved methods is just as important as the machines themselves. In other words, it is only through teamwork that greater production and consequent lower cost is possible. And teamwork is only possible and effective to the extent that it is voluntary and based upon confidence and fair dealings.

A Responsibility of Management

THERE is no more pathetic picture than an industrial plant with modern machinery and up-to-date methods hamstrung because the employees are not willing to use these improvements to their fullest advantage.

There is nothing more inspiring than an industrial organization which takes up new methods in such a way that the results are far beyond the expectations of even the most sanguine engineers.

And in nine cases out of ten the only difference between the first and second situation lies in the leadership which management is giving.

In the past few years there have been a number of industrial missions which have visited this country to find the secret of our high wages and general prosperity. In a sense, there is no secret to our wage level and prosperity. In the final analysis, they are due to a high per capita production, which, in turn, is due to our general use of machinery. But if one's analysis stops here, the answer will not be found. For, as I have indicated, the basic reason lies back of this—in our national attitude toward modern methods of doing things.

Some of the members of these missions were getting very close to the real cause when they noted the spirit of friendliness between management and employees and an unusually receptive attitude on the part of workers toward improved methods. If one finds the explanation for this, then one has discovered the true secret of our industrial progress.

But the explanation is not so simple. This relationship between workers and management, which brings about that teamwork, so essential to our economic progress, has not been created overnight. It is the result of many factors that go far back into our political and economic history.

One of the most important of these is our lack of class consciousness. Our industrial organization is unusually democratic. The wage earner of today is the industrial leader of tomorrow. The truth of this statement is borne out in the history of practically every industrial concern. As a result, management cannot be regarded as set apart from the rest of the organization. It is no super-imposed group. Its ranks are being continually filled from every position within industry.

With management, as it is, drawn from the ranks of industry, we have leaders with a sympathetic understanding of the problems of employees. Employees likewise have a better understanding of the modern responsibilities of management.

We have not always been conscious of the vital importance of this human side of our industrial life. Our economic development has been so rapid, the introduction of new inventions and the establishment of huge industrial enterprises came about so quickly and required so much attention, that at times the problems of industrial relations have not received the attention they merit. In the past decade, however, these subjects which are concerned with human relations in business have been better understood. Management has devoted more and more attention to them, and its work in this respect has been increasingly constructive.

I am convinced that this more enlightened attitude on the part of the management has made possible, in no small measure, the unusually rapid improvements which have taken place in production within this recent period. To understand how important such efforts have been, one need only try to imagine what would have been the situation had employees failed to cooperate in management's attempts to lower the cost of production through the adoption of up-to-date tools and methods.

Some Questions for Management

IF my reasoning is correct, if in its last analysis confidence on the part of employees and the general public plays such a vital role in our economic and social progress, we may well question ourselves continually as to whether these matters are receiving the practical business-like attention they deserve.

Are there still members of management who think that cheap labor is the ideal type of employee?

Are there those who still think that so much a day is a natural limit to what workers should receive?

Do we yet find those who know of no way to lower the cost of production otherwise than by the method of reducing wages?

Are there still those who think it is possible to obtain teamwork without having any real effective means of contact with employees?

Do some leaders of industry still think of the improvement of labor relations as a kind of frill to be undertaken when more weighty matters are attended to?

It may be true; but I am convinced that their numbers are rapidly declining, and their influence on the course of business is of ever-decreasing importance.

As a group, management now realizes that employee and public good will is an asset of immeasurable value—a priceless heritage which, by constructive effort, can be made of ever greater value to any industry and to our nation.

The unusual growth of our industrial system has enormously increased that mutual responsibility and essential common interest which exists between business and the public. The large numbers of employees and stockholders in our modern business, the interdependence of all industries, the economic, social and political effects of business policies and practices have made our industrial corporations, in effect, public institutions, in which the rights of all must be accorded proper recognition. We must frankly realize that this tendency will necessitate closer contacts and require complete frankness, both with employees and the public.

The first step toward meeting this responsibility is the continual development of far-sighted policies and practices by management. This means an adoption of all those sound measures which will build up the confidence and good will of employees. It demands much study, plenty of patience, and, above all, honest dealings.

It is essential that industrial management should continue to build up an open-minded attitude toward change and improvement, an attitude which, as I have said, is one of the most vital factors in our industrial supremacy.

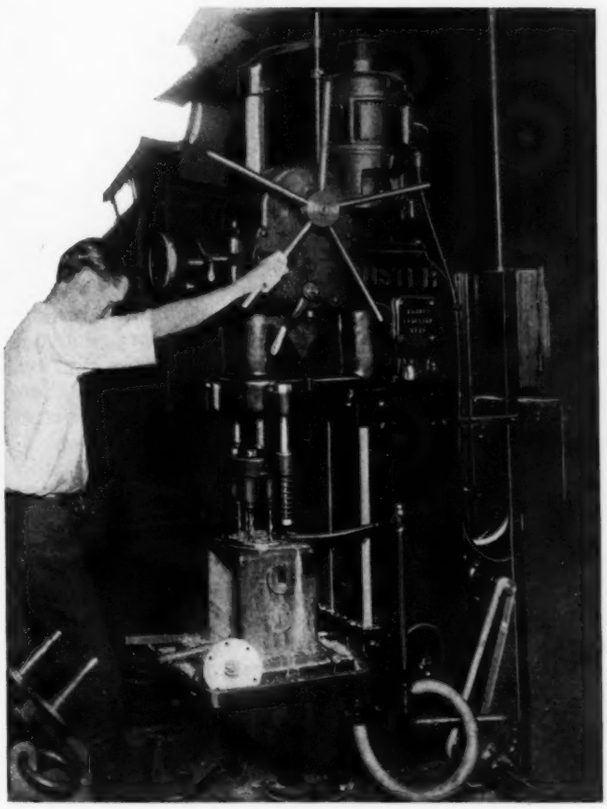
¶ There is no more pathetic picture, says Mr. Ching, than an industrial plant with modern machines and methods "hamstrung" because the employees are not willing to use improvements to the fullest advantage.

¶ There is nothing more inspiring than a plant which takes up new methods in such a way that the results are far beyond the expectations of even the most sanguine engineers.

¶ And in nine cases out of ten the only difference between the first and second situation lies in the leadership which management is giving.

Mounting Motors and Control ON Machines

Machine mounted motors and control utilize the space more efficiently if properly installed so that they can be readily serviced



Vertical motors are used mostly on pumps, valves and machine tools. In general, they can be mounted by using the base furnished by the manufacturer, especially when the drive is direct

IN selecting a location for motors, there are several factors to be considered. The release of valuable floor space and overhead space may be made possible by the selection of the proper location for the motor and the right type of mounting. In choosing the location for the motor and control, the amount and character of the space required are important. Motors and control may be mounted on the top or under the machine, or on the same base with it. The use of direct drive is usually the greatest saver of floor space.

The proper utilization of the space available may permit the use of smaller floor area for the machine and hence, a larger number of them may be used in a given floor space. The production per unit of floor area in the factory using the machines is thus increased. Where motors are properly built into the machines, as shown in some of the accompanying illustrations, less space is usually required than if belted motors are used and a better location of the machine is made possible. The user of the machine can move it and its driving unit about at will. The installation cost of the machine and, therefore, the cost of moving it about the plant are decreased. Hand starters and control apparatus are often placed so that they occupy valuable floor space which could be used to much better advantage for other machines. Automatic control, however, may be mounted overhead or under the machine, the starter being operated by means of push-button stations.

In utilizing the available space to the greatest advantage certain standards should be observed:

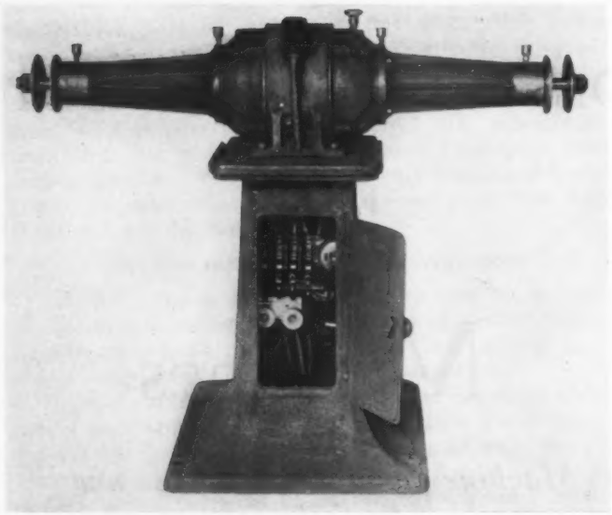
1—Does the method of mounting utilize the minimum floor area? Space above or below the floor is usually cheap.

2—Does the location of the starter or control interfere with the convenient handling of the material or the machine?

3—In case of a breakdown, can repairs be made easily? For example, if machines are too close together, it may not be possible to remove a rotor without first taking the motor from its mountings. If the motor is built into the machine without the proper reference to this point, the user will necessarily lose considerable time in making even minor repairs on the motor.

Accessibility is an important point to consider in locating the motor and control. If the motor and control switches are easily reached, not only will inspection be more frequent but time will be saved in the making of repairs. Experience has proved beyond doubt that the easier the manufacturer makes the inspection job, the oftener the motor and control will receive attention, and, hence, the

This illustrates the common practice when mounting a motor and a pump on the same base. The base offers a rigid mounting. Ordinarily it will be found necessary to use shims to obtain the proper alignment



Mounting the control directly on the machine adapts itself most readily to machines using the motors of 15 hp. or smaller. Here is a buffing machine with the control mounted in the base

useful life of the machines will be increased. It should be possible to remove the end shields easily so that bearing linings may be replaced. The control device should be so placed that there is ample room for it to be fully opened for inspection of the contacts or for making repairs.

The advantages attendant upon the use of built-in motors and control depend to some extent on the ease with which oiling and cleaning may be accomplished. Hinged covers on the machine base, inclosing the motor, are an aid to cleaning. Some of the machines illustrated herewith have another feature which is helpful in the cleaning operation. The oil filler gages are extended to the outside of the frame where they can be seen, filled with oil, etc., without the necessity of the workman getting at the inside of the inclosing housing. As a guide to determine whether the motor and control are accessible, the following questions may be considered:

1—Can the bearings be easily oiled?
2—Are commutators or slip rings easily inspected and are the brushes easy to replace?
3—Is there sufficient room to easily and quickly disassemble the motor or control to renew bearings, clean the windings or replace the contact parts?
4—Can control covers be swung back as far as desirable, or, with larger starting devices, can the oil tanks be lowered the necessary amount?

The provision of proper ventilation of motors built into the machine should also be given careful consideration. Motors and control should be mounted, wherever possible, in a clean, dry and well ventilated position. This is particularly true of resistors and other heat dissipating devices. By attention to this feature the useful life of the apparatus will be increased and the amount of upkeep and repair minimized. The temperature of the surrounding air is also important. The motor manufacturers design their standard open motors to carry full load continuously with a temperature rise not exceeding 40 degrees C. This temperature rise is based on an ambient or surrounding temperature of 40 degrees C. Therefore, motors should not ordinarily be installed where the ambient temperature is more than this value. In any case the actual measured temperature should not exceed 90 degrees C. Extreme heat will cause winding and bearing troubles; extreme cold interferes with lubrication. Where the ambient temperature is below zero degrees C. or above 40 degrees C., it will in nearly every case be necessary to use a special grade of oil.

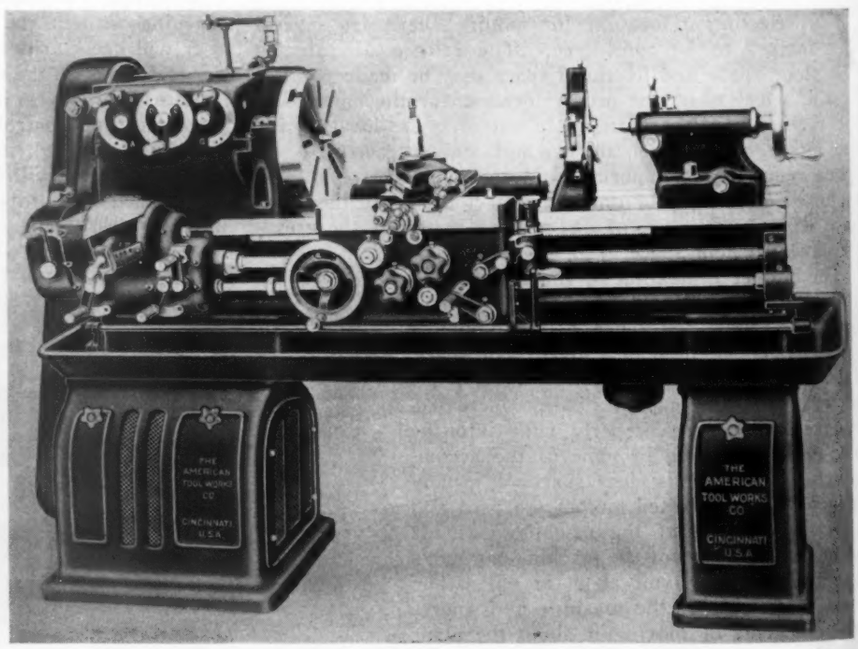
Place Machines Carefully

CARE should be taken to see that the motor is not located over escaping steam or where water can drip on it. Valve, sump and mine motors operate under such conditions, and in order that they may have satisfactory length of life they are provided with special insulation and special frame construction. Injurious gases, such as sulphur dioxide or acid fumes, should also be avoided or proper protection provided. Motors on machines for use in dairies, near salt water or in ice cream plants should be so located and protected that they will not be subjected to corrosive moisture any more than is necessary.

Motor driven machinery is often installed in laundries where, during the day, the air is quite warm and full of moisture. At night work is stopped and the air cools down with the result that moisture condenses on metallic parts. This type of service is very severe on the motor insulation. The heating and cooling process is in effect a breathing, so that as the motor cools, moisture is drawn in, condensing on the interior. To protect motors operating under such conditions, special guards over the motor mounting or special insulation must be used.

The following questions will serve as a guide to determine whether due consideration has been given to atmospheric conditions:

1—Is the temperature surrounding the motor less than 40 degrees C. and above zero degrees C.?
2—Are the motor and control properly housed so as to be protected against dust and dirt?
3—Is the motor to operate over escaping steam, or in

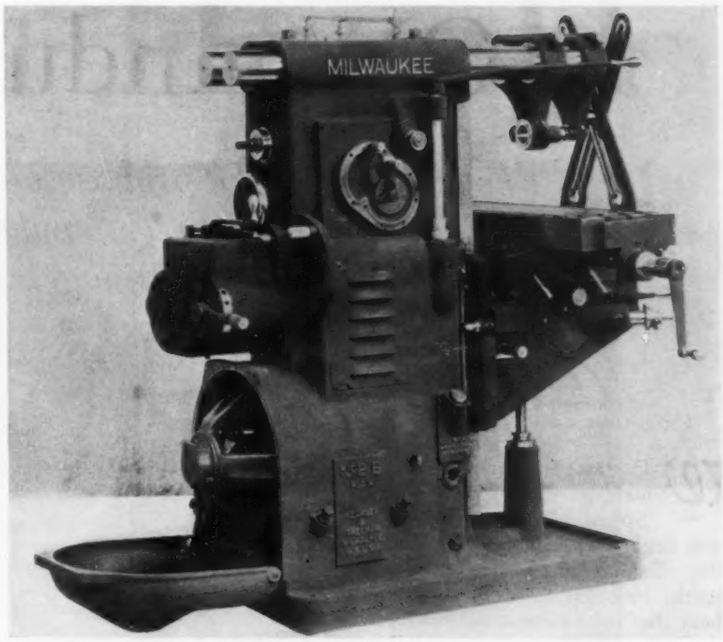


This illustrates a neat way of building the motor and control into a machine. The tendency is to reduce the head room or overall height of the machine. This method does this and also utilizes the space under the machine which heretofore was wasted

extreme acid or alkali conditions? If any of these conditions prevail, special insulation should be used.

The accompanying illustrations show typical examples of the methods of mounting motors on machines, so that they will be accessible, will not increase the floor space needed by the machine and in such a manner that the motor will be adequately protected against fumes, dust, dirt, etc. A recent development has been the use of high speed motors in the woodworking industry where the cutting tool is mounted directly on the motor shaft. Mounting the tool directly on the motor shaft eliminates the mechanical transmission losses which are unavoidable where belts or gears are used. This same type of motor may also be used on such machines as vertical grinders, cross-cut saws, etc.

Motors and pumps are commonly mounted on the same base. This base is usually made of cast iron, which offers a rigid foundation for both the pump and the motor and assures the machines staying in alignment after they are properly installed. It is ordinarily found necessary to use shims under the motor feet in order to obtain accurate alignment. This method represents accepted practice for mounting motors direct connected to pumps in capacities up to 75 hp. Above 75 hp. conditions vary so that no set rules can be given.

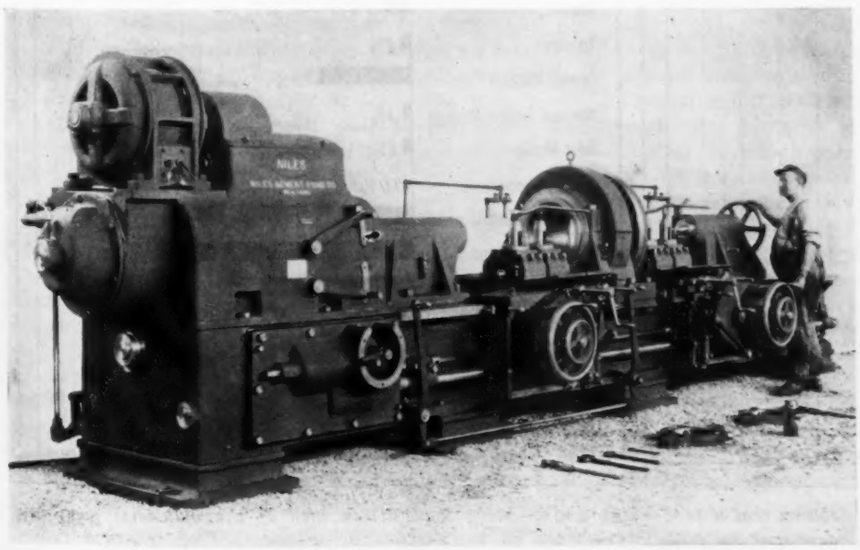


When the motor is mounted in the base of the driven machine, less space is required than when belted motors are employed. Ample ventilating openings must be provided to avoid excessive heating of the motor

Motor bases offer a convenient means of tightening belt and chain drives where these are found necessary. With motors of 5 hp. and below, it is often more convenient to turn the motor upside down and place the base on the motor. The base is much lighter in weight than the motor and can therefore be handled much easier. By using a base, the support of which is adjustable, the motor can be moved up and down to compensate for changes in the length of belts or chains and maintain a constant tension.

Vertical motors are used mostly on pumps, valves and machine tools. In general, these motors may be mounted by using the base furnished with the motor by the manufacturer. In some cases, however, vertical motors are belt connected to other vertical shafts. For applications of this type, either tripod or pedestal mountings are necessary. Motors of 5 hp. and below may be mounted on an angle iron tripod but above this horsepower a cast pedestal or tripod is generally used for additional strength.

Having chosen the proper location for the control as discussed in the foregoing part of this article, the next step is to properly mount the control. Care should always be taken to mount control equipment using contactors or relays in a strictly vertical position. Mounting the control on the machine adapts itself most advantageously to machines using motors of 15 hp. and below. Because of the wide variety of types and sizes of machines it is difficult to give specific examples. One of the accompanying illustrations shows a buffing machine with the control mounted in the base. The push button is very convenient for the operator, being mounted on the motor between the two buffing wheels. It frequently happens that the control may be mounted on the machine very easily by drilling two or four holes in the frame of the machine or by using a simple bracket. Another of the illustrations shows a convenient method of building the motor and control into a lathe. The base at the head end is enlarged to enable the equipment to be placed inside. The present tendency in applying motors to machines is to reduce as much as possible the head room or overall height of the machine. Placing the motor and control in the base accomplishes this and does not increase the floor area required.



This is a typical example of how a motor can be mounted on the top of the driven machine. Here it is easily accessible and conforms to the general outline of the machine

In general, hand and automatic compensators are mounted on a structural steel framework beside the machine and supported by the machine frame.

ELECTRICAL MANUFACTURING acknowledges the assistance of the General Electric Company in the preparation of this article, some of the material being taken from the booklet entitled "The Mechanical Installation of Electric Motors and Control."

How Industry Buys

The seller faces the problem of selling not only his product but also a large number of men who have a say in the decision ultimately made by the buyer

By R. O. Eastman

President, R. O. Eastman, Inc., New York and Cleveland

Mr. Eastman's article is based on a survey made for the A. W. Shaw Company of Chicago, and the charts accompanying the article are used through the courtesy of that company. In the May issue of Electrical Manufacturing Mr. Eastman discussed the "what, why, how and when" of market surveys.

The Editor

We started to ask the general manager of a large factory in Springfield, Mass., some questions regarding his purchasing methods. Taking his cigar out of his mouth, he said, "I can tell you all about that in three minutes. We have a routine method for purchasing everything. The foreman or department head fills out this requisition form, and passes it to the purchasing agent, who places the order. Requisitions for equipment which cost more than $100 must be approved by an officer of the company. That's all there is to it."

"Good," we replied. "Now let's trace in detail your last purchase of an electric motor, or an industrial truck, or welding equipment."

He thought in silence for several minutes. Then he said:

"Well, those are exceptions. It's necessary for more people to get in on transactions of that sort."

And then he started to tell the story of the purchase of his last industrial truck. Before he finished he had his plant superintendent, his purchasing agent, his engineer, and his treasurer around him, supplying information about the transaction. And before they

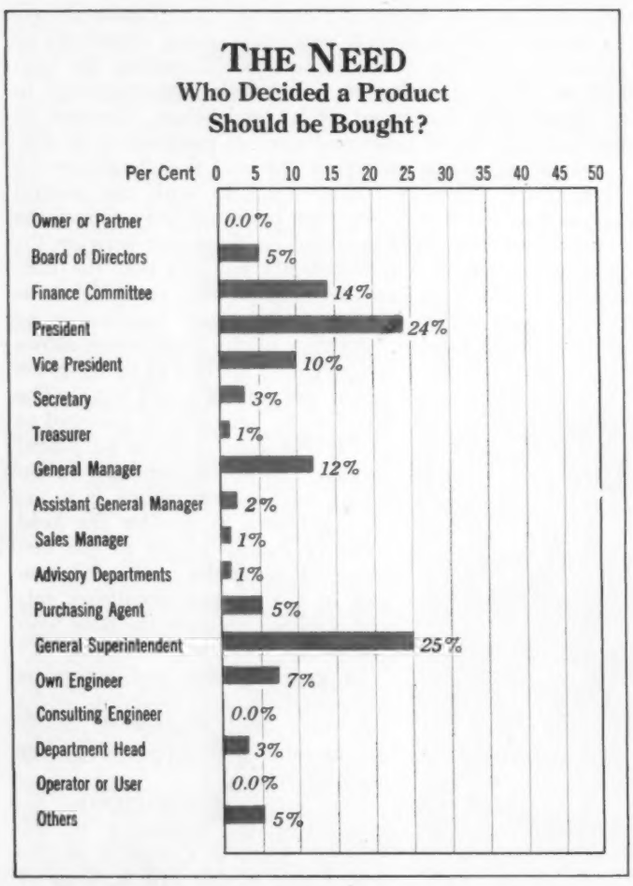


Figure 1—This chart shows who made the decision that a product should be bought—the general superintendent and the president most of the time, with several other departments having a say in the matter

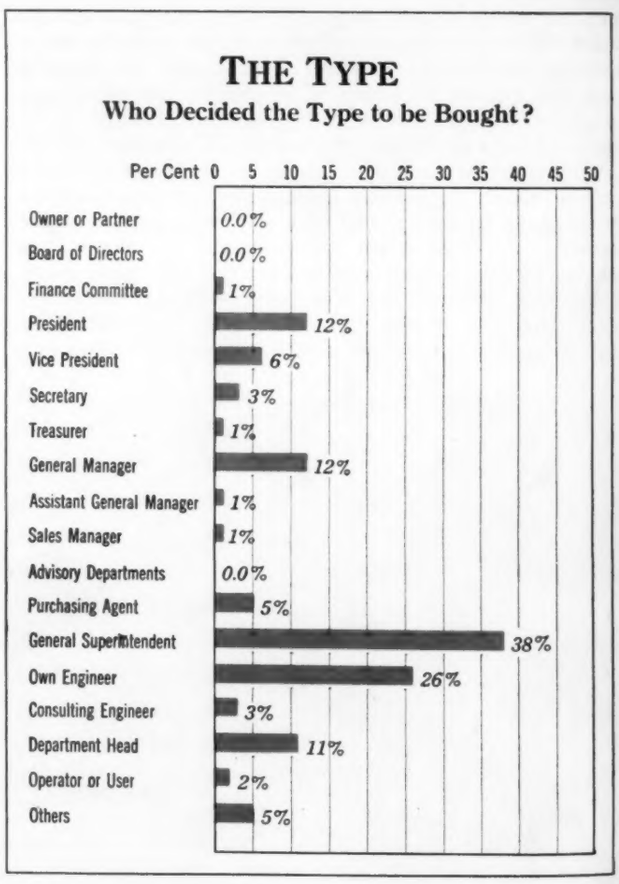


Figure 2—More than fifteen men in the industrial plant are concerned in the decision as to the type of electrical equipment to be bought, the general superintendent saying the final word most frequently

S Its Electrical Equipment

(Photo by Underwood & Underwood)

"Do we need to buy this equipment? Would this type fulfill our need? Is the make or brand the best value we can buy?" These are three questions which not one but several executives in the industrial plant have a say in answering before new equipment or supplies are purchased

had finished talking they—and we—had learned a lot.

In the next few weeks we had many similar experiences. So we concluded that the way industrial equipment is supposed to be bought is not the way it is actually bought.

Our purpose was not to discover ways and means of improving purchasing methods, but rather to determine, for the benefit of sales and advertising managers of companies selling industrial equipment, how manufacturers *buy* equipment; and even more specifically, what individuals, within their organizations, participate in purchasing and what functions they perform. This survey was made for the A. W. Shaw Company of Chicago.

Three Decisions Must Be Made

THE most startling conclusion which this survey presented was this:

Most industrial equipment is bought rather than sold.

Such a conclusion quite obviously has a far-reaching significance to those concerned with the marketing of goods to industry.

But first let us review some basic facts which led to this conclusion. In the purchase of every piece of industrial equipment, these three important decisions must be made:

1. That there is a *need* for such a product.
2. That this *type* of product fulfills this need.
3. That this *make* or brand of product is the best value and should be bought.

From a marketing point of view, these steps constitute three tasks. The salesman or advertising, or both, must sell the *need*, the *type*, and the *make*.

Here are three hurdles of competition which the seller must pass before the prospect can be made a customer. First he and all of his competitors, manufacturing products which conceivably could fulfill the need in question, are in competition with all the other manufacturers of industrial equipment and supplies for that share of the industrial dollar which might be used to fulfill *any* of the needs that confront the buyer. Unless the need for the product is so obvious or so pressing that it cannot be denied, it must be sold against the competition of the many other needs that are ever present.

Through the study of several hundred specific transactions involving the purchase of industrial equipment, we have found that not one individual but several individuals in the buyer's organization participate in the consideration of the *need* of new equipment.

Who Makes the Decisions?

THE department head, more frequently than anyone else, suggests the need; higher officials, including the president, the treasurer, and the general superintendent of the plant, must approve the need. The department head rarely has authority to approve the expenditure of money for new equipment. In fact, among all the transactions involving the purchase of plant equipment and supplies, the department head is authorized to approve the need in only two per

cent of the transactions which were covered by the survey.

Thus a wide variety of people, as well as a large number of people, must be convinced of the need for new equipment. And the range of the seller's fire must be correspondingly wide. If he is to convince buyers of the need of his product, he must reach top executives as well as those further down the line. The purchasing agent rarely has anything to say as to whether or not his company has a genuine need for new equipment. He suggests the need in only 4 per cent of the transactions, considers it in only 10 per cent, approves it in 7 per cent, and makes the decision to buy in only 5 per cent.

MOST industrial equipment is bought rather than sold—a fact of great significance to those concerned in marketing electrical equipment to industrial plants. The need for the equipment, its type and make—these are the three hurdles of competition which the seller must leap to make a new customer.

With the need sold, the second hurdle of competition presents itself. That hurdle is—selling the type of equipment to fulfill that need.

Provided that there is more than one type of equipment that will supply the need, as there usually is, the competition is then between the several companies within the industry which make different types.

For all plant equipment and supplies, the two individuals who most frequently have the deciding voice with respect to the selection of the type of product to fulfill the need are the general superintendent, who decides upon the type in 33 per cent of the transactions, and the plant engineer, who has this authority in 26 per cent of the transactions.

With the type decided, the third hurdle of competition appears, the only one which is given much consideration by marketing executives; namely, the competition with directly competing makes or brands.

At this juncture, the purchasing agent comes into the picture, for the first time, as an important factor.

Because it is the practice of most companies to require salesmen to interview the purchasing agent, this executive was found to consider the make in 28 per cent of the transactions. He is surpassed by the general superintendent, who considers the make in 33 per cent of the transactions, and is followed by the plant engineer, who considers the make in 21 per cent of the transactions.

In making the final decision as to the make to be bought, the general superintendent is the most important man. He has this responsibility in 37 per cent of the transactions, while the purchasing agent makes this decision in only 25 per cent of the transactions.

It is safe to say that there is little or no business in industrial equipment that is acquired without active and vigorous competition in selling the need, the type, and the make—particularly with respect to the need and the type.

The man who gets the order is the survivor of an extended elimination contest. The seller is faced with the problem not only of selling the need for his product, his type of product to fulfill that need, and his make or brand

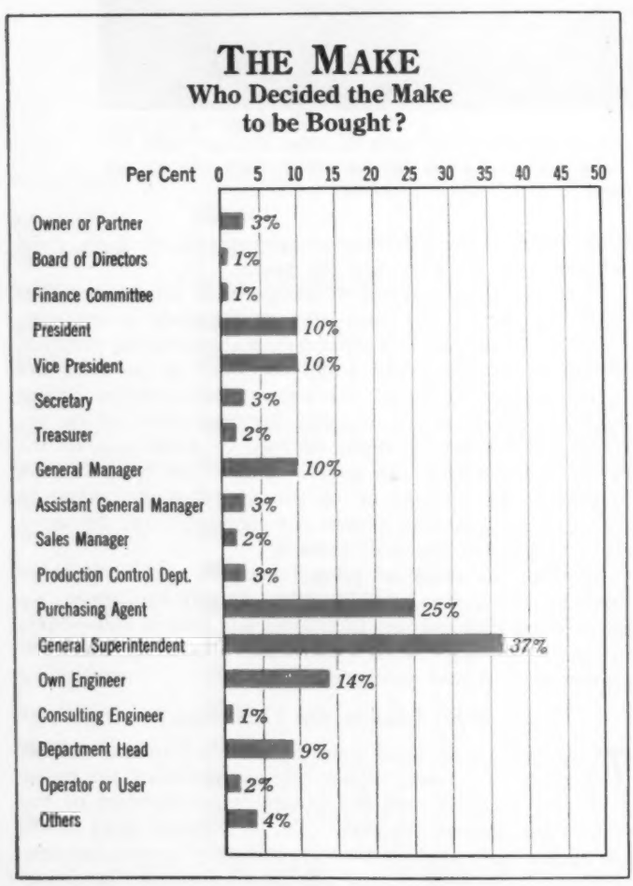


Figure 3—Because most companies require salesmen to interview the purchasing agent, he considers the make of the equipment to be bought in 25 per cent of the transactions

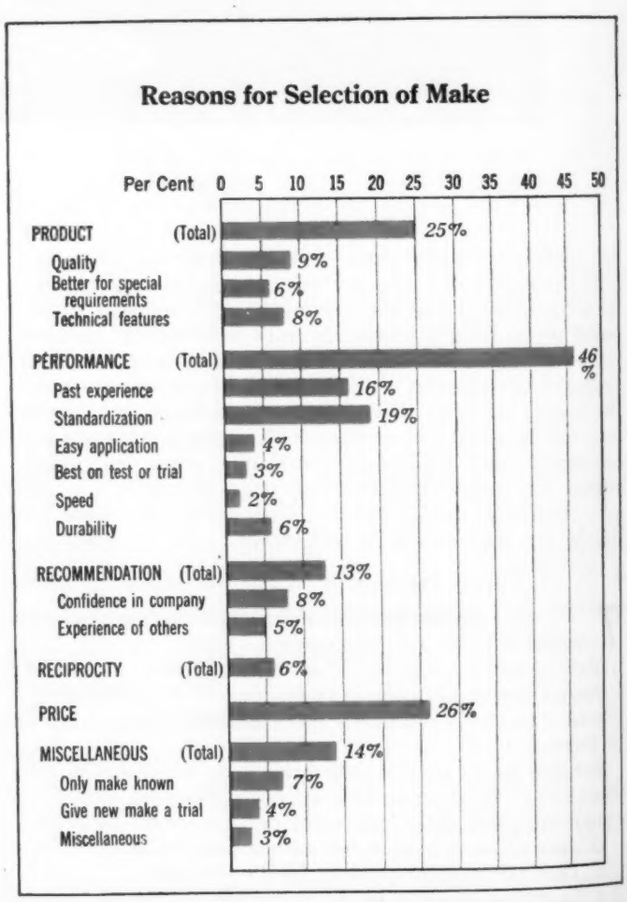


Figure 4—The performance of the product is the chief reason for selecting the make to be bought in 46 per cent of the cases. Price is the reason in 26 per cent.

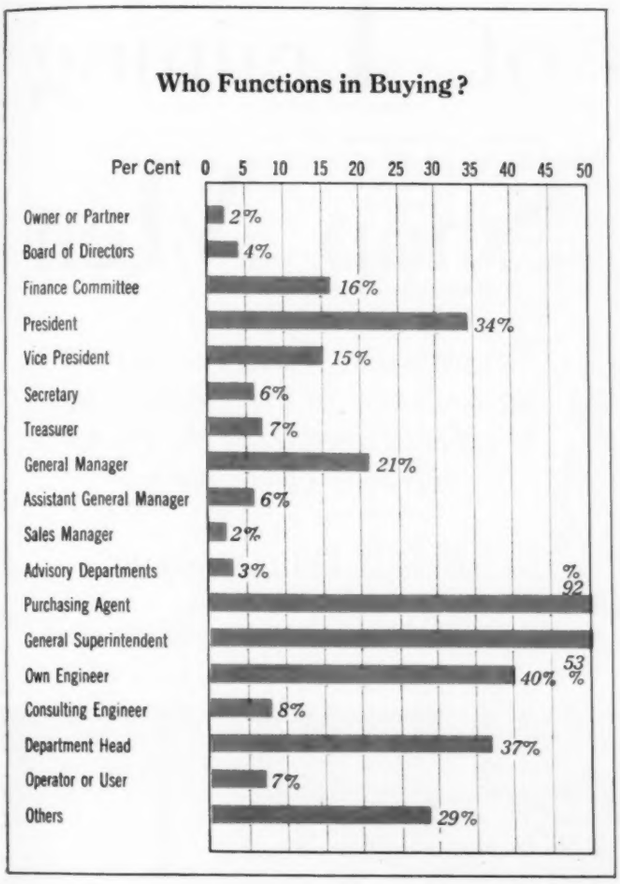


Figure 5—The purchasing agent and the general superintendent have a distinct lead among those who function in buying electrical equipment for use in the industrial plant

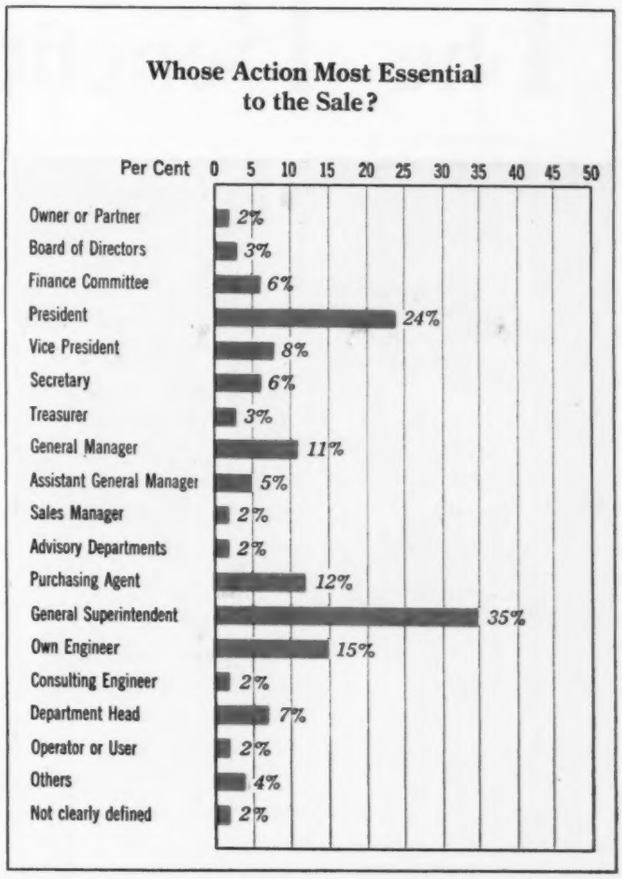


Figure 6—The general superintendent and the president of the industrial plant are the individuals whose opinions as to the product are most essential to the sale of equipment

in preference to those of his direct competitors, but also with the problem of selling a wide variety and a large number of people in the buyer's organization who play important rôles in the decision of the need, the type, and the make. The number of individuals who have to be sold varies between one and nineteen, and the average is five.

In addition, the seller is faced with the habit of buyers of industrial equipment to consider only a very few makes. In the purchase of plant equipment and supplies, only one make is considered in 39 per cent of the transactions. When it gets to the point of getting a bid or seeing a salesman, only one seller is permitted to present his case in 45 per cent of the transactions, or almost half.

Even more difficult is the problem of "getting in" on the transaction during its early stages.

In the transactions studied, salesmen "got in" while the need was under consideration in only 9 per cent of the instances. Salesmen were contacting with the buyers while the type was under consideration in only 25 per cent of the transactions. Salesmen were in contact with the buyers while the make was under consideration in only 68 per cent of the transactions.

Thus, without talking to salesmen, buyers of industrial equipment are deciding upon the need in 91 per cent of the transactions, upon the type in 75 per cent of the transactions, and upon the make in 32 per cent of the transactions.

IT is doubtful whether the salesman ever will have the opportunity to contact with all individuals in the industrial buyer's organization who play important rôles in buying. Most of the real selling is done inside the organization by members of the buyer's personnel.

Most of the real selling is done inside the organization by members of the buyer's personnel. Whether this is a desirable state of affairs, we may well hesitate to judge. But it is the condition, and we venture to predict that it always will be.

It is doubtful if salesmen ever will have the opportunity to contact with all of the individuals in the buyer's organization who play important rôles in buying. Some other method of reaching these people must be found.

What are the reasons governing the selection of the make of plant equipment and supplies which are purchased? Of the broad classifications, "performance" leads. It was one of the controlling reasons for the selection of the make in 46 per cent of the transactions, and "standardization" was responsible for the selection of 19 per cent of the cases. Past experience ruled in 16 per cent of the cases. The trend toward standardization has reached the point where it determines the selection of the make of plant equipment and supplies in almost one-fifth of the transactions. Closely allied, and almost equally important, is "past experience," which was one of the controlling reasons in 16 per cent of the transactions. "Price" was found to be one of the deciding factors in 26 per cent of the cases, and the construction of the product was one of the controlling reasons in one-fourth of the transactions which were covered by the survey.

The Benefits of Training Shop Men

Cooperation between departments is one of the outstanding benefits derived from the proper methods of training

By H. L. Hildenbrand
Engineering Editor
Electrical Manufacturing

The time study man observing the operations of machining and drilling, and the testing supervisors are better enabled to do their work after they have had a chance to study the shop work by doing it themselves

THE men in the shops of a manufacturing plant who know the production scheme from beginning to end are always the most valuable and the most efficient. Such employees realize the part that each department plays in the general production plan and are, therefore, better able to plan their own work and cooperate with the other departments to the fullest extent. There is no source of men who can satisfy all the requirements of the manufacturer's shop organization. Consequently, the easiest and the most satisfactory method of providing men with the desired experience is for the manufacturer to design courses in his own plant which will furnish the training that seems to be needed most in his particular circumstances. These courses will, of course, differ in every plant and must be adapted to the plant demands and supply the training which seems to be lacking in men for any particular line of work.

Courses for this purpose have been developed by the Westinghouse Electric & Manufacturing Company and have been in use for many years. These courses and the way in which men were picked for them were discussed by W. M. Emerson of the works manager's department of this company in the May issue of Electrical Manufacturing. These courses were summarized in a table in the first article. The accompanying chart shows the shop organization scheme of the Westinghouse Company from the works manager on down and also shows the way the men are placed after they have taken the different courses marked as A, B and C.

The advantages of training courses of this type are:

1—Cooperation between different departments is fostered.

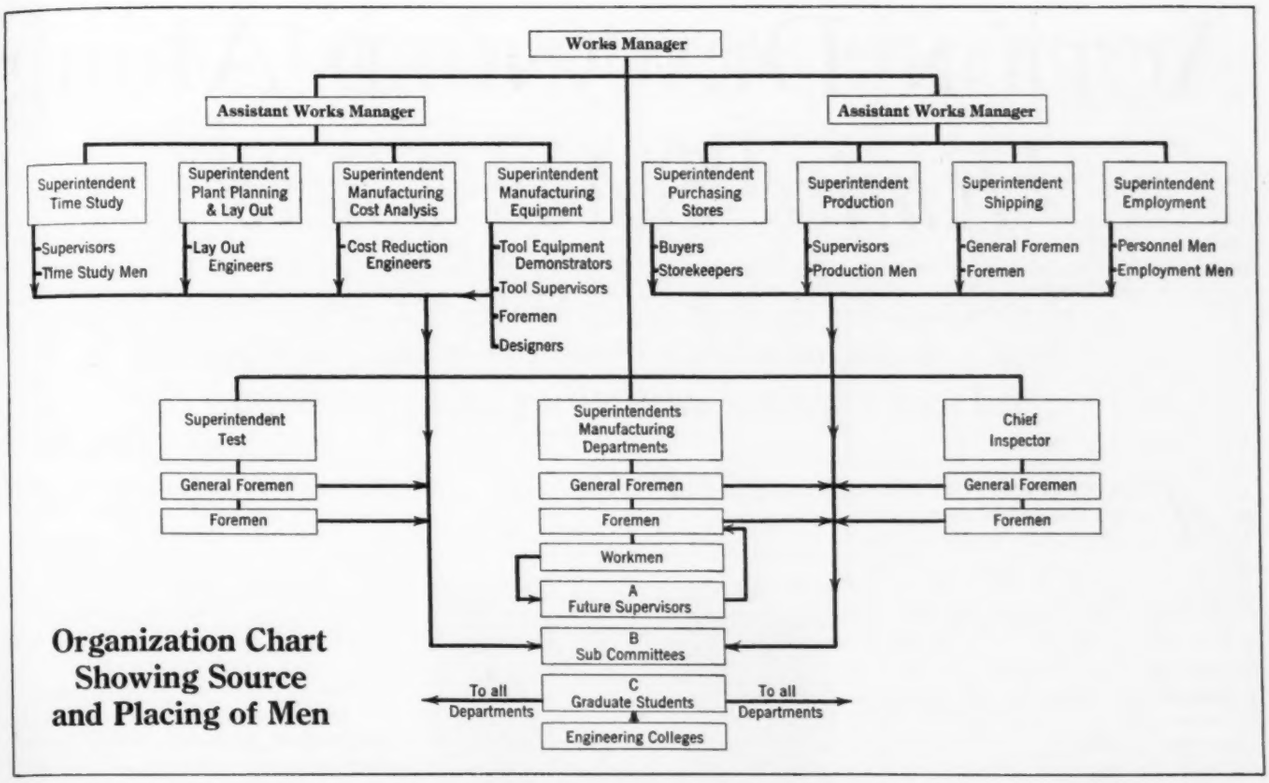
2—Group spirit is developed.

3—The shop organization is less specialized and men are available at all times who can be transferred to other work.

4—Men with combined technical and executive ability are developed.

5—Labor turnover is decreased.

In the shop where little or no thought has been given to the training of shop foremen and supervisors, each man is inclined to regard the work of other departments rather lightly. He has a radically different point of view than he would have if he had had a chance to work in each of these sections and encounter the same problems that they must solve in their daily routine. However, after he has had a training course designed to give him this broad outlook on the production scheme, he is capable of appreciating the function of each department and governs his dealings with these sections accordingly. This cooperation and the group spirit is developed further by the



Organization Chart Showing Source and Placing of Men

The word Supervisor as used in this article includes all men, with the exception of workmen, coming under Superintendents as listed on this chart, which shows the organization of the entire shop and the placing of men from the training courses

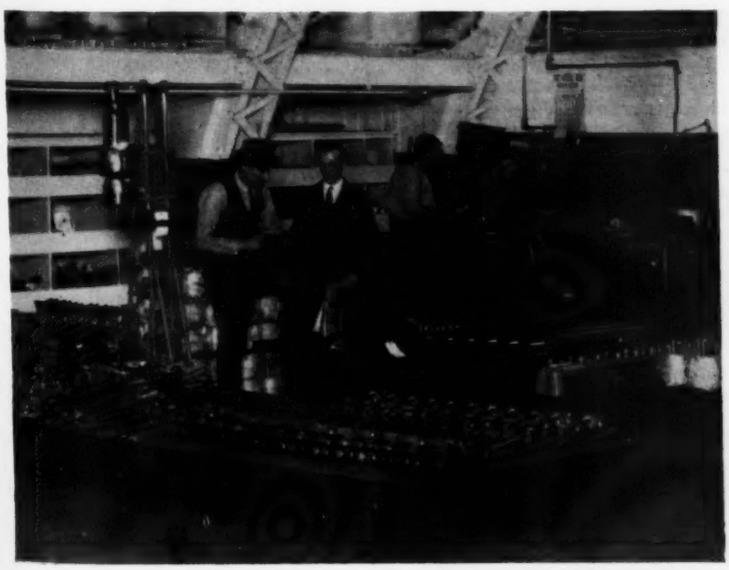
arranging of picnics and outings where the men can meet each other on a social basis. The friendly attitude will more readily prevail in the dealings between foremen of different departments, and rush order work as well as the regular routine will run much more smoothly.

It is sometimes desirable and very convenient to have men who are familiar with other parts of the organization so that a shift can be made without the usual waste of time while a man is becoming acquainted with the work done in another section. The use of the proper training courses, properly supervised, will accomplish this and make the organization much more flexible.

The system of training in use in the plants of the Westinghouse Company provides courses for the college graduates hired for the different shop and engineering departments. The college training has taught these men the fundamentals of their particular line of work, but they still are not suitable for immediate work in the plant organization. Their previous training furnishes only the background on which the manufacturer must build still further. They must learn the shop procedure, etc., and in addition they must be trained along slightly different lines and obtain a new point of view in the solution of problems than they were trained to get in college.

Executive ability must be brought out and developed. The only way to satisfactorily determine just which ones of these men are particularly suited for a particular class of work is to observe them while they are doing a variety of jobs. The preference of each man combined with the observed results or the work he has accomplished in the different departments shows where each one belongs in the organization. Men with executive ability or men who have a natural tendency to be leaders can be picked in this manner. However, care must be used in making this selection. According to Mr. Emerson, "Such courses must be regarded as supplementary for the structure of leadership must be built up right on the job with the benefit of the individual's work in the particular occupation he wishes to follow."

A further advantage of adequate training courses is the reduction of labor turnover. After the men have had a well designed and well supervised course of training they are more interested in their work. They feel more at home in the plant, for they have made a large circle of friends in the organization and have had a chance to look over all of the departments.



The foreman of an assembly section and the inspector can cooperate in their work more efficiently if both of them have had the proper training and understand the difficulties which each of them encounters

Action Demanded Along *Entire* Sales Line

Studies of other industries prove our pace is too slow. As an industry we need to organize a powerful and sustained advertising and sales drive

By J. E. Davidson
Chairman, Commercial National Section, N. E. L. A.

Scores of electrical manufacturers, exhibiting their products at the N. E. L. A. convention at Atlantic City on June 6, listened with others to an inspiring call to action by Mr. Davidson. Portions of his address, which deserves a hearing by all groups in the industry, are here reproduced for the attention of manufacturers who were not present. His words are significant not only in view of the plans of the newly established commercial sales department of the N. E. L. A., but also because of the progress which is being made by the Electrical Industy Sales Conference, whose market development activities the manufacturers will later be called upon to support, along with other groups, in a substantial manner. THE EDITOR

ACTION is called for today along the entire sales front of the whole electrical industry. That is the most important message of the hour. It is not only a question of the opportunity, which is vast, but of necessity as real as it is pressing. It is not a question of preparedness. It is not one of plan. It is not one of internal betterment, important as that problem is. It is whether or not our industry is to meet the challenge of the other great industries.

I know of no industry which has engaged in more numerous or more intensive association activities than has our own. Through the National Electric Light Association, National Electrical Manufacturers Association and The Society for Electrical Development, we have moved energetically to put our house in order, commercially speaking. While it would be premature to say that such task has been accomplished, I do not hesitate to suggest that enough has been done to justify shifting the emphasis of our strategy to the consumer selling front.

There can be no question that the strides of other industries prove our pace is too slow. In many respects our market is growing faster than we are. I do not mean to criticize the sales efforts of individual companies nor of individual groups. Splendid individual sales and advertising campaigns are being carried on. But collectively we are not engaged in that unified and coherent action which alone holds out the promise and the hope of those victorious results to which we know we are entitled.

Other producers are eagerly availing themselves of opportunities which are equally ours. The basic facts can be boiled down to the statement that not by any means are our endeavors getting the share of the consumer's dollar which is our just due.

The keenest competition of all is not among individual manufacturers, but among industries themselves. In our fight for sales we are competing with the whole roster of great industries among which the consumer distributes his purchases. Why is it that we are not making greater headway? As an industry we have not organized for a powerful and sustained advertising and sales promotion drive to impregnate the entire consuming public with what we call "electrical consciousness."

We need this drive. We need it to enhance the pulling power of our product advertising, to sell the idea of these products in advance, or in conjunction with our efforts to sell the products themselves. Without it we are depriving our individual and group activities of the free and effective play we all desire. * * *

We have been so occupied with our individual problems that we have been content to accept business as it came to us. We have aggressively pushed our respective lines—thinking solely in terms of electric refrigeration, electric irons, toasters and other like appliances. But we have not faced the whole broad canvass of the possibilities of electrical development. Why exult to the country and to ourselves over the wonderful advancement which electric service has brought about? Instead we should point out to every American home owner the fact that we and they are merely on the threshold of almost undreamed of advances. * * *

There must be a concerted drive to sell not only appliances but *electrical ideas.* Power companies have done remarkably well in their urging of the wiring of old and new homes. The need for appliances thus created has been as effectively filled as created. But the surface has barely been scratched. No industry is further from the saturation point than our own. * * *

A full tide is flowing for us today. The moment for decision is here. But it must not be a haphazard movement to which we commit ourselves. Whatever large scale campaign we determine to enter upon must be backed by special sales promotion material, thoughtfully prepared for the requirements of the individual groups which make up the electrical industry.

Forgive me if I seem too ardent. But let me urge, with all the force of a deep faith, that we adopt the master strategy of striking with all the force we possess—now!

What the Sections of Nema Have ACCOMPLISHED

The National Electrical Manufacturers Association is divided into sections, each one of which is a self governing group of active manufacturers

SINCE its formation on September 1, 1926, the National Electrical Manufacturers Association has made itself felt throughout the electrical industry. It can point to the following major accomplishments: the consolidation of the manufacturing branch of the electrical industry; the establishment of an executive forum through the formation of the Policies Division; the development of industry statistics; the development of a uniform electrical ordinance; and the bringing of the benefits of a trade association to previously unorganized groups of manufacturers. Nema is divided into four divisions: supply, apparatus, radio and appliance. These in turn are subdivided into sections. The achievements of these sections are outlined on this and the next page, and the pictures of the section chairmen appear in this issue of ELECTRICAL MANUFACTURING, beginning on page 121.

THE EDITOR

Supply Division

Armored Conductor and Metallic Conduit Section

This was among the first group of sections organized in the early days of the Associated Manufacturers of Electrical Supplies and has always been an extremely active section. It has reported statistics, has been active in standardization, and works in cooperation with the Underwriters' Laboratories. It has recently been instrumental in combating local propaganda against the use of armored cable and in protecting the interests of the section against restricted action taken by labor unions.

Carbon Section

This section was originally organized in 1916. It is now undertaking, in connection with the Standard Accounting and Cost Manual of the electrical industry, a comparison of the methods of different companies in determining cost of production and cost of sales.

Electrical Porcelain Section

This section was organized in 1916. It has an active committee on freight classification which, through its activities, has been largely instrumental in bringing about the readjustment of freight rates covering porcelain products. The section is now planning to—

(1) Conduct a research to discover new uses of porcelain.

(2) Improve present wiring methods.

(3) Inaugurate cooperative tests of porcelain qualities.

Rubber Wire Group

The wire manufacturers were originally organized as the Wire and Cable Section of the Associated Manufacturers of Electrical Supplies, and was one of the first sections organized in the Association. The manufacturers have since reorganized in separate sections covering the various products included within the scope of the Wire and Cable Section. Among these is the Rubber Wire Group, which is now preparing a standard on rubber insulated wire, which it is hoped will soon be ready for adoption as a Nema standard. The section is considering the reporting of statistics to Nema headquarters. Through its Industry Conference it has close contact with the Underwriters' Laboratories.

Air Circuit Breaker Section

This section was organized in 1918 in connection with the meeting called by request of the Bureau of Conservation of the War Industries Board for consideration of elimination of certain types of apparatus. It has accomplished splendid results along standardization lines.

Attachment Plug Section

This section was organized in the early days of the Associated Manufacturers of Electrical Supplies. This section has adopted a standard for separable attachment plugs and receptacles, and works closely with the Underwriters' Laboratories. It also collects statistics.

Knife and Enclosed Switch Section

The Knife and Enclosed Switch Section was organized in 1915 shortly after the organization of the A. M. E. S. This section has always been active in standardization matters, a number of its standards having already been printed in the Nema Supply Handbook. It also works closely with the Underwriters' Laboratories, and with the other wiring device sections on interlocking standardization matters. It originally held four meetings a year, as did the other A. M. E. S. sections, but since the formation of the Nema it holds two regular meetings a year, in January and June, in connection with the general meetings of the Association.

Lamp Receptacle and Socket Section

The Lamp Receptacle and Socket Section is one of the oldest sections in the Association, having been organized in July, 1915, shortly after the organization of the A. M. E. S. It originally included the manufacturers of attachment plugs, but these were later organized as a separate section, known as the Attachment Plug Section. The section has always been active in standardization matters, and has adopted a number of standards which have been printed in the Supply Handbook. Through the Industry Conference of the Underwriters' Laboratories, it has maintained close contact with the Laboratories in the promulgation of new standards. The Committee on Uniform Cost Accounting of the section was active in urging the adoption by its members of the Standards Accounting and Cost System of the Electrical Industry.

Industrial Lighting Section

This section was originally organized in 1917 as the Industrial and Street Lighting and Fixture Section, but has recently been reorganized as the Industrial Lighting Section. It has been divided into two groups —the Metal Reflector Group and Glass Group. It has reported statistics through Nema headquarters for a number of years. Considerable standardization work has been done by the section, although its standards have not yet been published.

Rigid Conduit Section

Immediately after the formation of the Associated Manufacturers of Electrical Supplies, one of the two first sections organized was the Interior Conduit Section This was later reorganized into several separate sections, one of which is the Rigid Conduit Section. The conduit industry has for years compiled statistics and has also been extremely active in standardization

work with the Underwriters' Laboratories. This section holds meetings practically every month.

Non-Metallic Sheathed Cable Section

This section was organized about two years ago, since which time it has been actively engaged in standardization work in cooperation with the Industry Conference of the Underwriters' Laboratories.

Signalling Apparatus Section

This section includes in its membership manufacturers of signal gongs, telephone apparatus, fire alarm apparatus, annunciators, bells, buzzers and signaling devices. The section has adopted a number of standards which have been approved and published in the Nema Handbook of Standards. The section has recently been holding meetings about once a month.

Snap Switch Section

This section was organized in 1915 as a section of the Associated Manufacturers of Electrical Supplies. It has a number of Standards which have been adopted and published in the Nema Handbook of Standards, and has recently gone on record as being in favor of the compilation of statistics through Nema headquarters. It cooperates with the Underwriters' Laboratories in the development of standards.

Flexible Cord Section

The Flexible Cord Section was organized in June, 1927. During the one year of its existence it has collected monthly statistics of shipments and stocks on hand of flexible cord and heater cord, and has endeavored to educate the public regarding the harmful effects of producing and selling sub-standard material. Standards for flexible cord have been approved by the Standards Committee, and will be issued in printed form in the near future. The Technical Committee on colors has worked out a standard color card which is being distributed to all manufacturers of flexible cord. The section plans to collect statistics on the production capacity of the flexible cord industry.

Fuse Section

This section was organized in 1915 shortly after the formation of the A. M. E. S. This section has always been actively engaged in standardization matters, and has adopted a great many standards which have been published in the Nema Handbook of Supply Standards. Through the Industry Conference it cooperates closely with the Underwriters' Laboratories. It cooperated with the Standard Accounting and Cost Committee in the development of the Standard and Cost System, most of the members having adopted this manual as a basis for cost methods. This section has voted to compile monthly statistics on sales which will be distributed through the headquarters of the National Electrical Manufacturers Association.

Panelboard and Distribution Board Section

This section was organized in 1915 as the Panelboard and Switchboard Section, but has recently changed its name to Panelboard and Distribution Board Section. It has recently voted to collect and distribute statistics through Nema headquarters, in which compilation all manufacturers are invited to participate. The section is active in obtaining recognition and adoption of Nema standards by architects and engineers specifying these products. Through the Industry Conference of the Laboratories, the section keeps in close touch with the Underwriters' Laboratories in all standardization matters.

Overhead Trolley Line Material Section

This section was originally organized in 1916 as the Line Material Section. It has since, however, changed its name and is now known as the Overhead Trolley Line Material Section. This section has been extremely active in cost accounting work and was represented on the Standard Accounting and Cost Committee. It has adopted some standards which have been approved and published in the Nema Handbook of Supply Standards.

Vulcanized Fibre Section

This section was organized in 1923. It has adopted standards which have been published and largely circulated throughout the industry. It reports monthly statistics through Nema headquarters covering sales and stocks on hand. It has an active Tariff Committee which cooperates with the Tariff Committee of the Association.

Laminated Phenolic Products Section

This section has been in existence only six years, but during that time it has accomplished a great deal in standardization and other lines. It has to its credit a number of adopted standards which have been published in the Nema Handbook of Supply Standards. The members of this section have compiled statistics practically since the section was formed, reporting monthly sales through Nema headquarters. The tariff situation is one in which the section is greatly interested. It has an active tariff committee.

Non-Metallic Conduit

This section has been organized since 1916. It has reported statistics through Nema headquarters practically since its organization. A number of its standards have been approved and published in the Nema Handbook of Supply Standards. The section works with the Underwriters' Laboratories with its Industry Committee. The section recently appointed a Trade Extension Committee, and also voted to collect statistics on closed transactions.

Manufactured Mica Section

The Manufactured Mica Section was organized in October, 1927. The section has a number of standardization matters under consideration, and is already actively engaged in the reporting of statistics. The Standard Accounting and Cost System is one of the matters of considerable interest to the section, and it is now studying the Standard Accounting and Cost System with a view to adopting these methods. A Tariff Committee has been appointed to cooperate with the Tariff Committee of the Association.

Molded Insulation Section

This section was originally organized in 1915, but was practically inactive until November, 1927, at which time a meeting of the industry as a whole was called and the section reorganized. The minutes of its several meetings show such topics for action as establishment of standards for molded products, standards of quality for the purchase of molding mixtures, generic name for molded synthetic products, statistics, appointment of market development committee to investigate possibilities of developing new uses for molded products, trade policies, collection of statistics, etc.

Outlet Box and Switch Box Section

The Outlet Box Section was organized in 1916. The members have recently voted to separate into two sections—one the Outlet Box and Switch Box Section, and the other the Conduit Fittings Section. This was one of the first sections of the Associated Manufacturers of Electrical Supplies to give consideration to the subject of standardization, the result of which was the elimination of many unnecessary types and sizes. The section has adopted a number of standards which have been published and found of value in the industry. The section has reported statistics for many years through Nema headquarters. The section has worked closely with the Underwriters' Laboratories in the preparation of standards.

Conduit Fittings Section

This section, originally a part of the Outlet Box Section, did considerable standardization work and will continue these efforts as a separate section. It will also compile statistics through Nema headquarters.

Metal Molding

This section has adopted a standard on metal raceways for surface wiring, which has been approved and published in the Nema Handbook of Standards.

Apparatus Division

Electric Furnace Section

Last fall the Electric Furnace Section was organized to include the manufacturers of resistance type electric furnaces. One of the first actions of the section was to undertake the collection of monthly statistics of the electric furnace orders entered in dollars, units and kilowatts. At the last meeting it was decided to supplement these data with statistics showing the

(*Continued on page* 154)

Leaders of Nema Sections

SOME of the work and achievement of the sections of the Supply Division of Nema is evident in the "Nema Handbook of Supply Standards," a reference work of practical information concerning the manufacture, test, and performance of electrical supply products. This activity of the sections has resulted in greater uniformity in electrical engineering and manufacturing practice throughout the industry. It has harmonized practices in the industry, promoted production economies, and benefited millions of users of electric service

Supply Division Sections

T. A. McDowell
Air Circuit Breaker

O. H. Van Amburg
Attachment Plug

E. A. Williford
Carbon

Paul G. Duryea
Electrical Porcelain

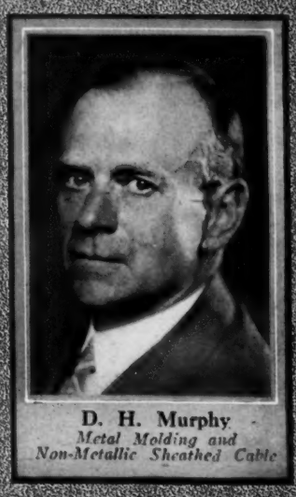
David S. Davis
Flexible Cord

H. T. Bussmann
Fuse

Arthur Miller
Industrial Lighting

J. H. Trumbull
Knife and Enclosed Switch

R. M. Eames
Lamp Receptacle and Socket

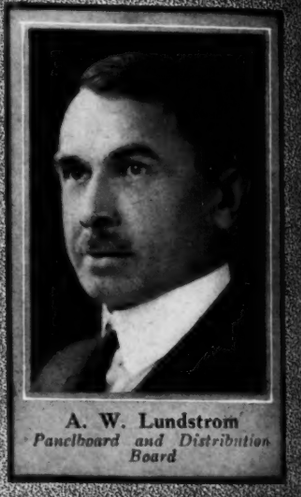


D. H. Murphy
Metal Molding and Non-Metallic Sheathed Cable

C. A. Kurz, Jr
Molded Insulation

L. F. Brahmer
Overhead Trolley Line Materials

Louis McCarthy
Manufactured Mica



A. W. Lundstrom
Panelboard and Distribution Board

THE Supply Division of the National Electrical Manufacturers Association formerly was the Associated Manufacturers of Electrical Supplies, which went out of existence when Nema was organized a few years ago

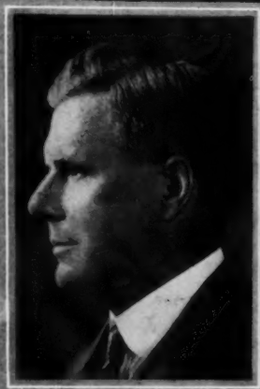
G. K. Heyer
Signalling Apparatus

H. C. Pond
Snap Switch

J. W. Marshall
Vulcanized Fibre

Apparatus Division Sections

L. W. Grothaus
Motor and Generator



J. F. Lincoln
Electric Welding

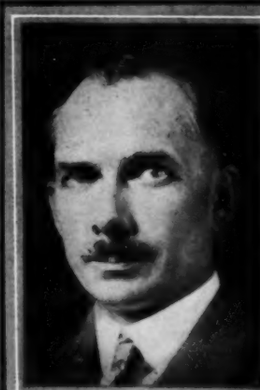
W. D. Little
Electric Furnace

J. H. Flory
Mining and Industrial Locomotive

THE Apparatus Division now fills the place in the industry which was formerly occupied by The Electric Power Club, while the Radio Division grew out of the former Associated Manufacturers of Electrical Supplies

T. E. Barnum
Industrial Control

L. C. Nichols
Transformer



E. H. Jacobs
Switchgear

G. A. Sawin
Electric Measuring Instrument

Radio Division Sections

Harold Olesen
Power Supply

L. W. Chubb
Receiver

George Lewis
Vacuum Tube

Julius Weinberger
Transmitter

Appliance Division Sections

M. C. Morrow
Electric Range and Water Heating

Other Nema Section Chairmen

Supply Division—Armored Conductor and Metallic Flexible Conduit section, E. J. Schneider; Conduit Fittings, George C. Thomas; Laminated Phenolic Products, E. H. Ott; Non-Metallic Conduit, I. A. Bennett; Outlet and Switch Box, A. E. Tregenza; Rigid Conduit, F. C. Hodkinson; Rubber Wire, R. C. Moeller.

Appliance Division—Fan Motor section, E. W. Knight.

H. J. Mauger
Heating Appliance

Applying Insulating Materials to Coils and Windings

No. 2 of a Series on Insulating Varnishes and Impregnating Compounds

The procedure when dipping coils in insulating varnishes and baking them is determined by the service conditions to which the coils are subjected

BY D. H. BRAYMER
Consulting Engineering Editor,
ELECTRICAL MANUFACTURING

AND A. C. ROE
Renewal Parts Engineering Department,
Westinghouse Elec. & Mfg. Co.

IN the first section of this article, published in the May issue of ELECTRICAL MANUFACTURING, the essential features of insulating varnishes for application by the dipping and baking process and of impregnating compounds for application by the vacuum impregnation process were discussed. In this article the practical details that will insure good coil insulation when dipped in suitable varnishes and then baked will be described.

The following treatment of armature and stator coils applies to all coils using round, square or rectangular double covered wire coils for operating voltages up to and including 2500 volts. All such coils should have one dip in a black plastic varnish before applying the slot section wrappers and finishing tape. Before this first treatment is applied all operations that require the use of untreated materials should be performed. This includes tieing leads, sleeving, binding tape on the ends, etc., to insure a good filling coat of varnish on all untreated material.

When the coils are of large cross section or intended for severe service, they should be given two dips. If the slot cross section is small, the first dip may be applied all over and the second on the ends only. This last treatment should extend at least ½ in. into the slot sections.

Moisture Driven Out

UNLESS the wire from which coils are made must be stored in damp places or under conditions where much moisture will be absorbed, it need not be preheated before dipping when a baking varnish is used. It has been proved that the subsequent baking drives out the solvent and moisture from the average stator or armature coil.

After insulating coils for use in machines up to and including 1100 volts they should be given one dip, except for coils used in mining motors, railway crane types or those exposed to moisture, dust, etc. These should be given two dips all over. For voltages up to and including 2500 volts, two dips all over should be given and for severe conditions two dips all over and one extra on the ends should be given. For 2500 to 4600 volt service, three dips should be given, two all over and one extra on the ends.

The number of dips can be varied to meet the conditions to which the coils are subjected in service. For proof against steam, acid fumes, etc., they should have at least four dips. In applying these extra dips, a check must be made of the slot room available in the machine. The slot sections of the coils should not be given heavy coats of varnish for the reason that when force is required to drive the coils into the slot, the varnish film is destroyed. Therefore, it is far better to apply one or two coats all over and the extra coats to the ends of the coils since these parts are exposed and the slots can be sealed after the winding operation.

When dipping coils, care should be taken to keep them separated, particularly during the finishing dips and bakings. When adjacent coils touch in the process of drying, a hard ridge is left when the coils are dry. Also, the rods on which the coils are handled should be kept clean. Constant use will cover the rods with a thick, soft coating and the weight of the coils will cause them to bed into this soggy coating and give a poorly treated appearance to the coils.

Careful Soaking Necessary

TO insure good penetration of the varnish into the depths of a coil being treated, the coils should be allowed to remain under the surface of the varnish until all air bubbles stop coming to the surface. Each bubble that appears means that varnish has taken the place of air on some part of the coil in the varnish. This soaking can be allowed to continue for 20 or 30 minutes after all bubbling stops and is well worth the time taken as the resulting varnish filling is more thorough. This extra soaking applies to all first dips, such as those given to coils before insulating and after putting on the finishing tape. Succeeding dips should not be allowed to soak any longer than required for the air bubbles to stop coming to the surface as there is the possibility of softening the first coat of varnish.

High Gloss Finish

WHEN a high gloss finish is desired the first coat should be baked dry and all bumps or rough spots rubbed down with fine sandpaper before applying the next coat. This sandpapering should be done to each coat, care being taken to rub down only the high and rough spots. When unsinged or finishing tape is used that has a high percentage of free lint, the coils should be singed with an open gas flame, to burn off the lint before applying the first coat of varnish. This is important when coils are to be given a high gloss finish.

The varnish tanks should be kept clean and covered when not in use. The corner of a coil dipping room is shown in one of the accompanying illustrations. The platforms seen at the right in front of each dip tank in this illustration are for draining the coils after dipping. The loaded truck ready to be placed in the oven shows how coils are separated. The varnish in the dip tanks is kept clean and

free from curdled varnish, dirt, etc., by the use of a blotter type filter press between each tank The varnish is filtered once a day.

Treating Lead Wires

WHEN dipping armature coils using cotton sleeving on the lead wires, the varnish should not extend up the lead a distance of more than ½ in. above the top of the coil. It was common practice years ago to dip the complete lead in the varnish, but this gave trouble in cleaning the leads when connecting up the armature. The untreated part of the lead can be filled with a plastic air drying varnish after connecting the armature and a black cotton sleeving can be used to improve the appearance. A white, untreated sleeve will, however, take the final treatment of air drying varnish better. The leads of strap copper and stator coils can be dipped in the varnish and retinned after baking.

Contrary to all that has been said against the use of air drying varnish for dipping of coils, there is a black plastic varnish on the market which is a slow drying varnish that can be hastened by baking from two to five hours, depending on the size of the coil or apparatus dipped. This varnish gives good results for first dipping of stator and armature coils or for small single phase stators. It dries leaving a tough, plastic coat and has good cementing qualities and high dielectric strength. Its main disadvantage is that it will run on the application of heat, which means that it should not be used to dip complete wound rotors either A.C. or D.C., nor used as a final dip on rotor coils for it will soften and throw out under load

Classification of Coils

FIELD coils can be classified according to the kind of conductor used and their applications. Under the first classification are round, square and rectangular double cotton covered wire and bare copper strap wound on edge, or flat, single cotton covered round wire, and enameled covered wire. Under the application classification, we have stationary and rotating field coils. In each class the coils may be exposed to moisture, water, acid fumes, steam, high temperature, etc.

The treatment of field coils will differ according to type and application. Double cotton covered wire for stationery field coils in ordinary industrial service will be discussed first. In this class we have shunt and series coils. On small machines the shunt coils are generally wound with single cotton covered wire. Coils using up to and including No. 17 B. & S. gage can be wound mush, or what is sometimes called promiscuously. Coils, not larger than four inches on each straight side may be dipped in a black plastic baking varnish and given a long, slow bake. For shunt coils wound with single cotton covered wires, No. 16 and up, the wire should be wound in layers. Double cotton covered wire should be used for wire sizes above No. 12 B. & S. gage and such coils not larger than four inches on each side can be dipped and baked as above.

Paper Between Coil Layers

IN the case of layer wound coils, it is necessary to use paper between layers to hold up the turns and even off the layer. The paper used should be absorbent, that is, not a hard glazed surface paper that will not take varnish. When coils either shunt or series exceed four inches to a side, it is better to paint the varnish on each layer as the coil is being wound and then dip the coil after winding. The same varnish should be used for painting as that used for dipping.

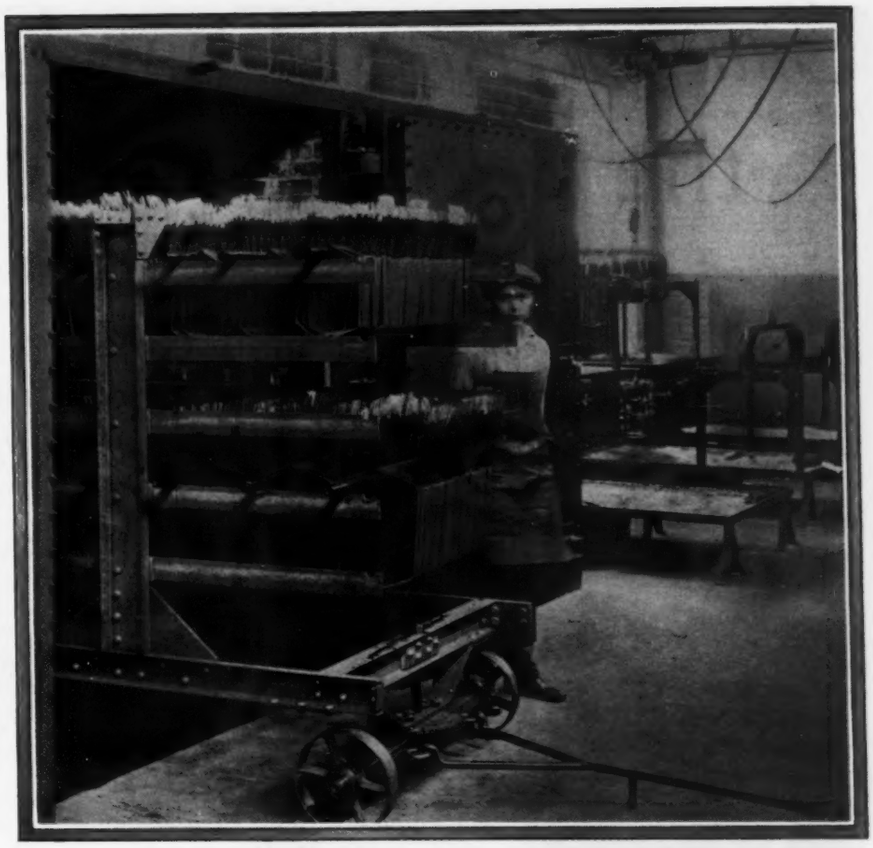
Shunt or series coils wound with either square or rectangular double cotton covered wire, when the coil sides exceed three inches, should be painted with varnish while winding and dipped after winding and any paper used should be absorbent. When the coil sides are less than three inches, the coils may be dipped after winding. Coils wound with enameled covered wire should not be dipped or baked and only small coils should be wound from this

The coils should be placed on the drying racks so that they do not touch each other as this causes a rough spot on the finished coil. The drying racks on which the coils are hung in the oven must also be kept clean in order to insure a smooth finish. The illustration above shows a typical oven with the heat control devices used for baking coils and windings

class of wire. Strap copper coils in which the conductor is wound flat with asbestos between turns and with sides up to six inches, may be dipped in a black plastic varnish.

Coils wound with the copper strap on edge fall into two groups: (1) Coils in which the turns are separated by asbestos paper. This type can be dipped and baked as above. (2) Coils in which the turns are separated by wood blocks at intervals and held together with cord bands. This is the type of construction generally adopted for large generator series coils. This type may be dipped in an air drying varnish when the coil is independent of the shunt coil, but when it is tied to the shunt coil, the two coils may be handled as a unit when applying the final dip to the shunt coil.

When winding coils of the revolving field type, care must be taken to cement the turns and layers together to make a solid coil that will resist centrifugal force. The first step is to have a tight wire space, so that the turns per layer are tight against each succeeding turn. Next, sufficient tension should be used on the wire and each layer pounded down to make a tight coil with all slack removed from wires between layers. Also cross-overs from layer to layer should be distributed and well protected with butchers' linen or drilling. Liquid bakelite can be brushed on between layers and, after winding, the coils should be thoroughly baked. This insures a compact coil and one that will not throw out varnish or compound when it becomes heated during operation of the machine.



The dipping tanks should be kept clean and covered when not in use. The platforms at the right in front of each tank in the illustration above are for draining the coils after dipping. The loaded truck ready to be placed in the oven shows how the coils should be separated to insure smooth finish

Finishing Strap Coils

STRAP copper coils when used as field coils are usually edge wound without any material between turns. After winding, the bulge of the inside diameter edge of the copper should be pressed out and any remaining high spots filed smooth. The coils should then be cleaned and dipped in shellac, coating all turns. Asbestos paper, which has been treated with shellac, should be placed between the turns. The coils should then be heated and put under pressure until set.

All of the above types of coil except those of the revolving field type and those operating under high temperatures, can be vacuum impregnated with good results. Coils using asbestos between turns and large wire wound coils should be preheated before the insulating varnish is applied. For ordinary industrial motor service, finished field coils should be given two dips and bakings. For railway or mining motors or whenever coils are subjected to moisture, at least three dips and bakings should be given. For special applications, as many as five dips and bakings may be applied. Each coat must be baked dry before each succeeding dip is applied. The sanding operation between dips can be dispensed with on field coils as high gloss is not so important on these coils.

Coils wound with enameled covered wire should not be dipped after insulating unless a varnish is used that the maker guarantees will not affect the particular enamel covering used on the wire.

The treating of field coils before and after insulating is a subject that involves a study of the type of coil, the wire used, and application of the coil and what is more important, the size and construction of the coil to determine the best method of getting varnish to all parts of the coil and drying the varnish after it has penetrated into the interior of the coil. Preheating of medium and large size shunt or series coils wound with double cotton or single cotton covered wire will drive out moisture and allow the varnish to penetrate more thoroughly. In fact, even for coils on which the varnish is brushed on between layers while winding, the insulation will be improved if after baking the coils they be given a dip in varnish while they are still warm. This will help to seal any pores or other openings and will add considerably to the useful life of the coil.

Asbestos Paper Insulation

COILS wound from bare copper strap with asbestos-paper between turns should in every case be preheated before dipping in varnish. This is necessary, due to the moisture absorbing characteristics of the asbestos paper and also due to the fact that the thinness of the asbestos and the pressure between turns makes it more difficult for the varnish to penetrate thoroughly and fill all of the material used between turns.

The next section of this series of articles on the application of insulating varnishes and compounds will discuss in detail the proper methods of varnish treatment for various pieces of apparatus which are completely wound before treatment.

Characteristics That Determine the *Selection* of MOTORS

No. 1 of a Series Discussing Motors of Different Types

The synchronous motor is a constant speed motor and has many features which make it superior to other types for some applications

Theo. Schou

BY

THEO. SCHOU
Chief Engineer
Ideal Electric & Manufacturing Company

AND

C. P. ROBINSON
Designing Engineer
Ideal Electric & Manufacturing Company

C. P. Robinson

THE motors in common use today to drive the various machines, appliances, etc., can be divided into four general classes according to their speed characteristics. These classes are: 1—Constant speed; 2—Multi-speed; 3—Adjustable speed; 4—Varying speed. It is the purpose of this series of articles to discuss all of the different types of motors under these four general headings. There are, of course, other features besides speed which determine the proper application of motors in many cases and these considerations will be discussed in connection with each type of motor in this general classification.

The Synchronous Type

This type of motor is a really constant speed alternating current motor. Geared, so to speak, electrically to the source of supply, it can only rotate at a certain constant speed determined by the frequency of the system and the number of poles, for which the motor is wound,

or: $\text{R.P.M.} = \frac{f \times 60}{P}$

when: R.P.M. = Revolutions per minute
f = Frequency of the supply system in cycles per second
P = Number of pairs of poles

Twenty years ago the synchronous motor was thought little of as a power motor. However, its value in correcting power factor was recognized and it was used as a rotary condenser, floating on the line, also as a motor for motor generator sets and other applications, where the starting requirements were light. Advances and improvements in the art, and also introduction of new types to suit special drives, have greatly widened its field of application and it is constantly gaining new ground, substituting for less efficient motor drives. The reason for the ever increasing popularity of the synchronous motor is due to several well known desirable characteristics, which are inherent in this type of motor.

The advantages of the synchronous motor over the so-called constant-speed induction motor may be summed up as follows:

1—*Simultaneously employed as a power motor and as a power factor correcting medium.* Unlike the induction motor, which has an inherent lagging power factor, the power factor of a synchronous motor may be varied at will by regulating its field excitation. The synchronous motor may be operated at unity or leading power factor, thus correcting or improving poor power factor while driving mechanical load. Synchronous motor loads are therefore naturally welcomed by utility companies and in many cases lead to preferential rates for the consumer.

2—*Slow speed—High efficiency.* Whereas operating characteristics like efficiency and power factor become so poor with slow speed induction motors as to make them impractical and obsolete for commercial use, the synchronous motor maintains splendid efficiency characteristics at exceedingly slow speeds. It should also be noted and taken into due consideration, that the efficiency curves of

synchronous motors have a flat characteristic whereas those of the induction motors have a decidedly drooping characteristic. This feature is brought out in Fig. 1 where test values of efficiency and power factor may be compared at various loads for a synchronous and induction motor of the same rated horsepower and speed. Figs. 2 and 3 give reference to full load efficiency of a modern line of synchronous motors both at unity and 80 per cent power factor operation. Similarly, for sake of comparison, Figs. 4 and 5 give full load efficiency and power factor characteristics of a line of squirrel cage induction motors. From these curves it becomes apparent that synchronous motors may be built for a much wider range of speeds and ratings than the induction motor—also that the unity power factor synchronous motor shows by far the better efficiency of the two types where the speed is low.

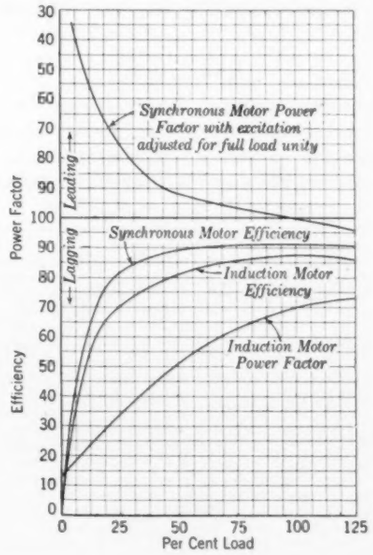


Figure 1—Efficiency and power factor curves showing the comparison between a synchronous motor and an induction motor. Both rated at 75 hp., three-phase, 60 cycles, 360 r.p.m.

3—*May be wound for high voltage, thus saving step-down transformers.*

Generally, the standard, revolving field type synchronous motor is well adapted for use on high voltage lines as its stator can be built with fewer and larger slots (of the open type) than are used for an induction motor and therefore the windings are easier to insulate. Depending more or less upon capacity and speed, synchronous motors may be wound for voltages as high as 6600 and even 13,200 volts.

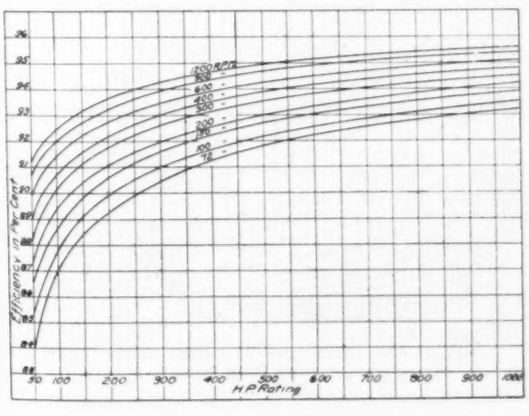


Figure 2—Efficiency curves of a modern line of synchronous motors of different speeds carrying full load and operating at a power factor of unity

4—*Mechanical ruggedness—large air gap.*

The air gap of synchronous motors is much larger than that of the corresponding induction motors. In induction motors it is desirable to decrease the air gap as much as possible so as to minimize the magnetizing current on which the wattless component depends and, thereby, establish satisfactory operating characteristics. The air gap of induction motors is therefore limited by mechanical conditions. With synchronous motors that, under normal operating conditions, have no inherent lagging power factor and slip, the air gap is limited by electrical conditions such as practical excitation and pull-out characteristics. Fig. 6 shows comparative air gap values for induction and synchronous motors of various ratings and speeds. A large air gap facilitates erection and lessens the danger of the rotor rubbing on the stator due to bearing wear and shaft deflection.

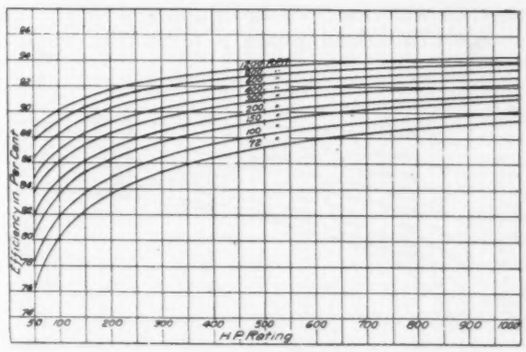


Figure 3—Efficiency curves of the same line of motors as shown in Figure 2, carrying full load but operating at 80 per cent power factor

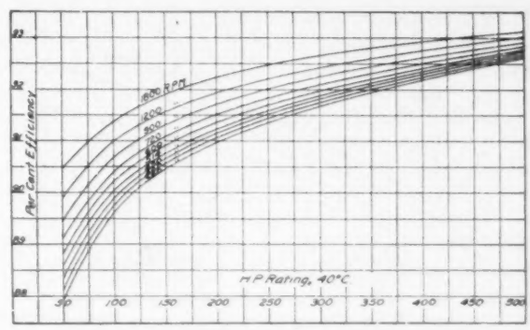


Figure 4—Full load efficiency curves for a line of squirrel-cage induction motors of speed and horsepower ranges comparable to the synchronous motors shown in Figures 2 and 3

5—*Inherent tendency to maintain constant voltage on a system.* The synchronous motor has a strong tendency to maintain constant voltage without use of a regulator as a drop in line voltage causes the motor to draw leading current, while a rise in voltage causes it to draw lagging current. This current, drawn through the reactances of the line and transformers, raises the voltage if the current is leading and lowers it if the current is lagging. The synchronous motor also tends to balance the voltages in the different phases of an unbalanced system. This is brought about through the more marked influence of leading current in the low phase.

6—*Lower cost.* The cost of this motor is less than the slip ring induction motor in larger sizes and less than any induction motor in slow speed ratings.

Disadvantages which may be charged against applica-

tion of the synchronous motors and especially so in case of the present conventional standard, are:

(a)—Limitation in pull-in torque. (This obstacle has been overcome by the Super-Synchronous and the Fynn-Weichsel type.)

(b)—Direct current excitation is required, thus necessitating two different sources of current supply for its operation. (This disadvantage is technically, if not economically, eliminated in motors of the self-excited or Fynn-Weichsel type.)

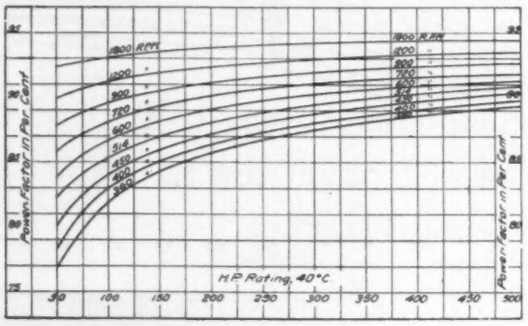


Figure 5—Full load power factor curves for the same line of squirrel-cage induction motors as those whose efficiency curves are shown in Figure 4

(c)—Whereas the absence of slip may be very desirable for some applications, it also limits the usefulness of flywheels in connection with loads necessitating same. (This point of disadvantage is also, more or less, eliminated in case of the Fynn-Weichsel type.)

(d)—It may have to be restarted if line conditions cause it to drop out of synchronism. (This condition has also been relieved by the Fynn-Weichsel type.)

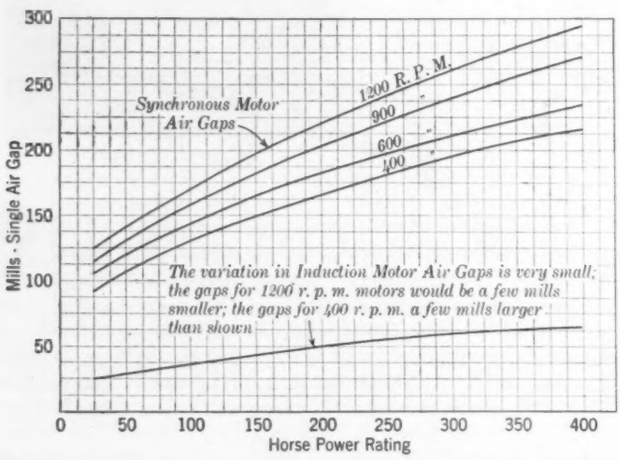

Mills - Single Air Gap
Horse Power Rating
Synchronous Motor Air Gaps
1200 R.P.M.
900
600
400
The variation in Induction Motor Air Gaps is very small; the gaps for 1200 r. p. m. motors would be a few mills smaller; the gaps for 400 r. p. m. a few mills larger than shown

Figure 6—These curves show the variation in the air gap distance of squirrel-cage induction motors and synchronous motors of different speeds and for horsepower ratings between 25 and 400

(e)—Higher cost than squirrel cage motors in high speed ratings.

(f)—Not adaptable to single phase operation.

Range of Sizes

Today synchronous motors are available and in common use in sizes ranging from 5 to several thousand horsepower, and for speeds from 60 to 3600 r.p.m. The great majority of motors installed range in size from 50 to 1500 hp. and in speeds from about 90 to 450 r.p.m. This fact indicates clearly that the synchronous motor is especially adapted to slow speed drives as a direct connected motor. The great bulk of synchronous motor installations today is of the standard revolving field type. Smaller ratings at speeds from 900 to 1800 are also of the rotating armature type. Large capacity high speed synchronous motors are not so generally in use. This is due to the fact that high speed synchronous motors cost more than the corresponding induction motor—also, barring leading power factor operation, it offers relatively small advantage over the equivalent induction motor, which at such ratings and speeds has a very satisfactory power factor and efficiency. However, synchronous motors, being non-self starting and also of too large a capacity, are not adaptable to single phase operation.

Excitation

All synchronous motors require direct current excitation. In most cases where a D.C. source of supply is not available, separate excitation current is supplied by motor generator sets, or the motors may have direct connected

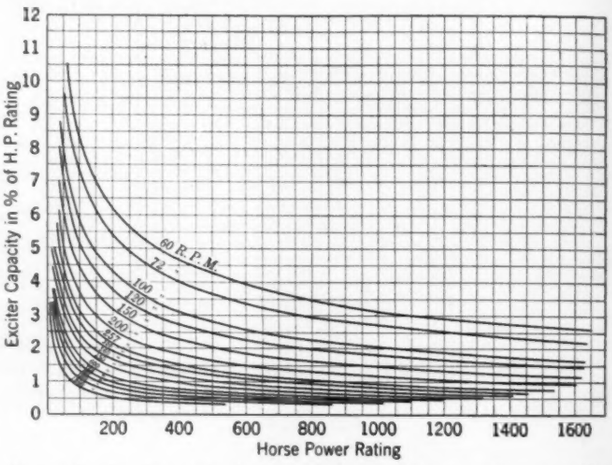


Figure 7—Exciter capacity in per cent of the horsepower rating required at 100 per cent power factor for 60-cycle synchronous machines of horsepower ratings up to 1600 and for speeds of 60 to 1800 r.p.m.

or belted exciters. In a few cases, of the rotating armature type, the motors are self excited. The usual excitation voltage is 125 or 250 volts. For a certain hp. rating the excitation required, exciter capacity, increases rapidly, as the speed decreases. Figs. 7 and 8 give reference to exciter capacity of a standard line of 60 cycle synchronous

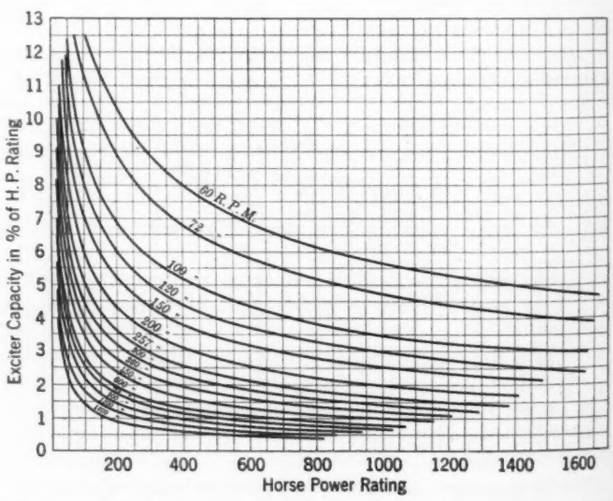


Figure 8—Exciter capacity in per cent of the horsepower rating required at 80 per cent power factor for the same 60-cycle synchronous motors whose excitation requirements are shown for 100 per cent power factor in Figure 7

motors both for unity and 80 per cent leading power factor, and Fig. 9 shows values of field current for various leading power factors based on unity power factor field current.

Starting Characteristics

The polyphase synchronous motor starts and attains speed as an induction motor, but as the starting or squirrel cage winding is used only during the starting period, we may arrange for a wider range of starting torque characteristics than in case of the induction motor, where operating characteristics must be taken into consideration. Synchronous motors may, therefore, be designed with as good or better starting torque than the induction motor. If synchronous motors were called upon only to start a certain load, they could meet any reasonable condition of application without trouble. Usually, however, the synchronous motor is also called upon to pull into step with various loads, depending upon the nature of the load to which it is connected. This fact introduces the pull-in torque characteristics which are just as important to arrange for as the starting. In this connection it should

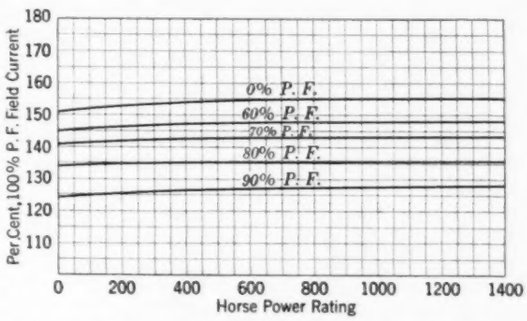


Figure 9. Values of field current for various leading power factors, based on unity power factor field current, for synchronous motors with a short circuit ratio of 1.25

be kept in mind that, depending upon load and flywheel effect, it is necessary to bring synchronous motors, starting as induction motors up to 92 to 96 per cent of their synchronous speed before pull into synchronism is effected. Fortunately, most commercial loads require either high starting torque with low pull-in torque or vice versa. Such characteristics can easily be arranged by using standard design. If, however, both high starting and high pull-in torque is required, starting with magnetic clutches or especially designed squirrel cage windings is used, or the synchronous or the Fynn-Weichsel type, which will be discussed later, is resorted to.

Operating Characteristics

The synchronous motor has a perfect inherent speed regulation. It runs at constant speed, at all loads, at unity or leading power factor. The efficiency curve is

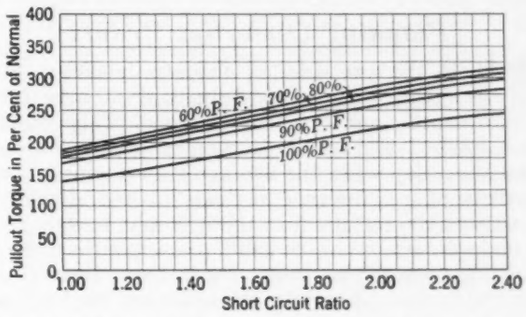


Figure 10. *Pull-out torque of synchronous motors in per cent of normal for various short circuit ratios and for various leading power factors*

high and has a flat characteristic, especially when operating at unity power factor. By adjusting the field excitation the motor may be operated at unity or leading power factor. Unity power factor exists when the motor, carrying a certain load, draws the minimum amount of current from the A.C. supply lines. Its stability is good and it will follow ordinary changes in frequency and voltage.

Pull-out Characteristics

The pull-out torque of a synchronous motor is as high or higher than the corresponding induction motor and, as the pull-out torque with synchronous motors varies directly as the terminal voltage, it is not affected by voltage fluctuations as much as induction motors, where the pull-out torque varies as the square of the terminal voltage. The pull-out torque of synchronous motors varies directly with the short circuit ratio and field current applied. Fig. 10 gives reference to pull-out characteristics of synchronous motors for various values of short circuit ratio and for operation at unity and various leading power factors. Modern synchronous motors are designed with a normal short circuit ratio of 1.00 to 1.5, and referring to the curve we find that such values correspond to a pull-out torque of 140 to 180 per cent when the motor is operated at 100 per cent power factor.

A Quick Method of Separating Nickel from Steel

THE shop had worked day and night to complete an electric locomotive, when it was discovered that some of the relays were equipped with steel, instead of nickel, contacts. Several sheets of steel had become mixed with the sheet nickel which is used to make relay contacts. Steel is worthless as a contact material; it oxidizes with low currents and quickly welds when subjected to an arc.

All the contacts on hand were doubtful and it was impossible to obtain new ones quickly. The nickel contacts had to be sorted from the steel. About 10:30 A. M. the stock supply of these metal strips was rushed to the laboratory with the request that enough nickel contacts to equip the dismantled relays be separated at once. But the speedy separation of the two metals seemed at first glance impossible. The strips looked exactly alike, both metals are magnetic, and neither hardness nor file tests were reliable. A qualitative chemical analysis was too slow.

A quick and accurate test was supplied by a fortunate inspiration—the use of the relative position of nickel and iron in the electromotive series. A beaker of diluted sulphuric acid, a small piece of sheet copper, a millivoltmeter, a pair of crucible tongs and some wire were quickly obtained. A piece of nickel held in the crucible tongs and dipped into the acid solution gave a reading of 15; a strip of steel registered over 100 on the meter. Within two minutes the necessary contacts had been sorted out.—C. H. Marshall, Westinghouse Electric & Mfg. Co.

Station G-A-G-E, Editor Speaking

Stanley A. Dennis, Editor and Assistant to the President

Planning Underlies Profits

UNDER the pressure of modern business, guess-work and rule-of-thumb method in manufacturing is doomed, and concerns founded or operated on such a method are equally certain to go by the board. There was a day when the average manufacturer, almost regardless of his internal methods of operation, could feel reasonably certain that there would be buyers for his products so long as he could manufacture them at a reasonable cost and so long as a business "panic" kept below the horizon. That day characterized the long years of a sellers' market, when manufacturers ruled things with a high hand and made customers dance like puppets on the ends of strings. Today business is in a buyers' market, and a buyers' market that barring a great natural or economic or social disaster may be expected to last for years to come. In such a market the buyer is king and business dances attendance on his word. In such a market, every kind of business concern must expect to be tried and tested. And in such a market guess-work, rule-of-thumb, and antiquated methods are so much dead weight which if not thrown overboard will slow down or sink a business regardless of its splendid history and high reputation.

What will take their place? Facts instead of opinion. Figures instead of guesses. Knowledge instead of supposition. Scientifically ascertained methods of operation instead of traditional factory habits. Budgetary control of manufacturing and selling activities instead of financial post mortems. Planning from the market back to material instead of planning from material to market. Forecasting and planning instead of rushing blindly forward in the dark.

Donaldson Brown, vice-president, General Motors Corporation, expressed this thought clearly and emphasized its importance in a recent address. He said:

"Forecasting and planning is the essence of modern-day business management. It is not the function of an individual or a department. It is in the conscious, co-operative work of an organization. The American manufacturer can no longer determine his course according to his ability to purchase the necessary raw materials and the capacity of his manufacturing facilities. No longer may he rest assured that there will be buyers for his products so long as he can manufacture them with reasonable cost efficiency, and barring a general business depression. Competition is keen and the cost of manufacture is not the only factor determining the success of the manufacturer. Efficient employment of capital is a consideration of great importance, and a sound, economical method of distribution, adapted to the particular circumstances, is essential. In the final analysis the ultimate consumer, with a wide range of choice, often afforded by a number of ingenious contenders, will exercise his preference on the basis of the appeal which a particular product has for him.

"Forecasting and planning is nothing more nor less than a system of control whereby production, purchases of materials, and the employment of capital are co-ordinated with sales requirements. Budgetary control is an apt phrase except that it is likely to imply a rigidity that must be guarded against. Flexibility is a prime requisite so that there may be a quick response, and thus the possibility of adjustment throughout the system to the requirements of changes of situation that are inevitable. The focal point of the system is the sales outlet. The flow at this point must be gaged and every other activity must be coordinated with it."

Ultimate consumer demand, recognition of the fact that a consumer of one product is the producer of another, employment, business depressions, efficiency of production, purchasing power, knowledge of the market, and channels of distribution are some of the important considerations on which any system of forecasting and planning in a manufacturing business must be based.

What is the significance of all this for the electrical manufacturer? It means for him just what it means for any other kind of manufacturer. It means, if it means anything at all, that successful manufacturing today demands executives of big mental caliber, men who can grasp countless facts, figures, conditions, and relationships and control them in a way that would have dumfounded executives of a generation ago. It means that a breadth of vision and a broad knowledge of economic law are essential to successful management. It means that executives must be in control who are not staggered by the amazing complexities of modern industrial and commercial life but rather who can master them in a way that will keep the business forging ahead toward high objectives, despite "hell and high water." Unless a manufacturing business is founded on this kind of ability, its future is about as unpromising as that of a house founded on shifting sand rather than solid rock. The future belongs to the executive who knows where he is going and why.

Who's Your Banker, Young Man?

SCATTERED throughout the country today is a surprising number of electrical manufacturing concerns less than two or three years old. Of course, some of these concerns will win out in the long race, but many of them will fall by the wayside. And when it becomes possible to look back on the history of these companies, it will be found that success, in many instances, was due to the care with which a banking connection was established, and that failure might have been avoided if greater care had been taken in finding a banker equipped to render quality service as a business counsellor. Certainly such is the lesson drawn from the past and there is no reason to expect that the future will change it.

Just how a bank can help guide a business through a critical period is indicated in the following story contained in a recent advertisement of the Equitable Trust Company of New York. ELECTRICAL MANUFACTURING has no interest in this company, but it is willing to help the bank drive home this point:

"An organization that had been in business for many years was caught, during a critical period in its line of trade, with a top-heavy inventory and current debts that were embarrassing. Its annual statement showed a deficit in working capital, and obligations that were considerably in excess of net assets. A fine old name and an excellent reputation were in danger. Borrowing had been resorted to until there was no chance to get further credit. The situation called for an immediate change in the methods of operation.

"Officials of this bank, fortified by their experience in

handling similar problems, were able to point out ways in which the company could operate within reasonable and conservative limits.

"Many opportunities were found for reducing or eliminating expenses that had crept in unnoticed and been accepted as necessary. It was found that some of the officers of the company had overloaded their departments, and these disadvantages were corrected.

"For months the company had to be guided with care and treated as leniently as safety would permit. Instead of being forced to close up its business at a ruinous loss, it was shown how to overcome its difficulties, and today it is operating profitably, with a working capital that is showing steady improvement."

When all is said and done, it comes down to this: that the right banker is a master-employee of a business, possessed of power to aid greatly in the production of profits and to render invaluable assistance in times of stress. On the other hand, a banker not able to render quality service as a business counsellor is an expensive employee, as it were, at any price.

A good banker, like a good doctor or a good wife, is above price. And the young man starting an electrical manufacturing business nowadays must needs choose wisely—in all three cases, for that matter.

Industry Speaks Up to Uncle Sam

NAMES of eleven nationally known electrical manufacturers and central station executives appear in the list of the one hundred and thirty-two members of the committee which prepared the "Platform of American Industry for the National Association of Manufacturers" for presentation to both the Republican and Democratic national conventions this month. Apparently the electrical industry intends to play its part in bringing about a better understanding and better cooperation of business and government.

Sixteen major subjects continuously affecting industry are embodied in recommendations contained in this platform. These subjects are: agriculture, Federal Reserve Bank System, flood control, foreign trade policies, government and business, immigration, international relations and foreign debts, judiciary, merchant marine, private employment relations, regulation of combinations, reorganization of government departments, tariff, taxation, transportation, and women in industry.

The platform is the product of industrial men from all sections of the country and is completely representative of American industry. It was shaped by republicans, democrats, and independents. It is presented to the major political parties merely as a set of fundamental ideas which industry, large and small, believes should be guiding principles or policies for any administration.

In a preamble, the manufacturers state:

"As business men, we have neither political favors to bestow nor request. Our primary obligation is to improve the means, conditions and quality of production and steadily advance the welfare of all engaged therein. The history of our country demonstrates that as our political policies are soundly conceived and administered the welfare of our people is promoted. Therefore from our experiences in the daily conduct of industry, we offer our suggestions to those about to deal with the political aspect of our national problems. We ask them to be tested by no other standard than the common welfare."

Space does not permit editorial comment on each of the sixteen major subjects in the platform, but there is one "plank" which does deserve the editorial spotlight for a moment. On the subject of "Government and Business," the platform makes the following declaration:

"The function of our government is political—not economic. It was neither conceived nor fashioned to engage in competitive enterprise with its citizens, nor to administer the tasks of production and distribution, nor to substitute the judgment of its agents for that of responsible and experienced management in the direction of business operations. It is the servant, and not the master of the citizen. It was established by him, under definitely limited authority, to protect and promote the pursuit of his chosen effort, assuring him security in the fruit of his endeavor, subject only to equal and impartial restraint essential to the maintenance of like opportunity and liberty for all.

"We urge more reliance upon private energy and character and less upon public law and appropriations. The interdependence and complexity of modern life make necessary new limitations upon individual liberty, but these are justifiable only as they are demonstrated to be necessary and practically effective to accomplish their purpose. Self-government is self-support. To discourage initiative and lessen self-reliance destroys the dynamic force of the individual. Our government must rely upon the support of the citizen; the citizen must learn not to lean upon the government."

Here is a statement of basic principle, which is also historically correct. It is exceedingly refreshing in these days when the average man does not know whether he is the maker of his government or the victim of it, when the average business man wonders just how far the government is going "to engage in competitive enterprise with its citizens."

The example of these eleven electrical manufacturing and utility executives engaged in an effort to bring about a sounder relationship between government and business is one which deserves the approval of electrical manufacturers as well as of the other branches of the industry. In the world today no industry can live to itself alone and certainly no business can long play the hermit and succeed. It is indicative of our industry's place in modern life to find it active in those councils which let us hope will effect a greater measure of peace and progress between politics and industry.

Beware the Gift-Horse

MANUFACTURERS who are contemplating a change of location will do well to remember that an ancient evil, the old-fashioned "bonus" offered by a town or city to induce a manufacturer to relocate within its boundaries, is now parading under the modern guise of "special inducement."

A report submitted to the Conference of Industrial Bureau Managers held under the auspices of the Chamber of Commerce of the United States has recorded more than 200 cities in practically every State which have given or would give special inducements to secure industries. The cities range in population from 3000 to 250,000. Cases are reported in which entire satisfaction resulted from the acceptance of special inducements, and a number of economic tragedies were also uncovered. It was found, also, that where some of the larger cities state that they do not give special inducements it is a common practice for real estate promoters to make 100 per cent building loans. It was found that certain industries are following a plan of demanding special inducements from towns or cities desiring them, even having special contract forms printed for this purpose. Out of forty-nine plants secured in this manner, sixteen are reported to have failed.

All of which emphasizes the wisdom of the ancient adage that it is well to look the gift-horse in the mouth before accepting it.

MARKETING SYSTEMS *for* Distributing Electrical Goods

No. 2 of a Series of Three Articles on Distribution

An analysis of several of the typical selling organizations which are being used to market electrical products in the United States

BY JOHN ALLEN MURPHY
Marketing Counsellor

IN the May issue of ELECTRICAL MANUFACTURING, we tried to present a bird's-eye view of the selling machinery that exists in the electrical industry. In the present article we will analyze several typical selling organizations. We will consider first the industrial side of the business, because it represents a larger volume than the retail side. Between eight hundred and nine hundred million dollars worth of electrical goods are absorbed by the industries annually. This is about sixty per cent of the electrical products manufactured in this country.

In marketing his output to the industries, the manufacturer usually employs these instrumentalities: 1, his own salesmen; 2, branch offices; 3, manufacturers' agents; 4, wholesalers or special supply houses.

Practically every electrical manufacturer employs salesmen, regardless of what marketing plan he may follow. The salesman is the most universally prevailing institution in the industry. The manufacturer may or may not have branch offices or wholesalers or other types of representatives, but it is a safe bet that he has some salesmen.

The territorial type of representation by salesmen prevents extravagant traveling and makes a more thorough working of the trade possible

Salesmen operate in various ways. They travel either out of the home office or out of a branch office. Where they operate from a branch, they are usually answerable to the branch manager or branch sales manager, in case the organization has sectional sales executives.

If the company has no branches, it is customary for the salesman to live in or near his territory. When a company is new, there is a tendency for it to let its salesmen wander all over the map, hitting the high spots and picking up the easy business. At this stage of development, the salesmen commonly hail from headquarters, no matter where their territories may be. This, however, is a most wasteful method of traveling. As soon as a concern begins to organize, it generally abandons this hop-skip-and-jump system, in favor of the territorial type of representation. This plan prevents extravagant traveling and makes a more systematic and thorough working of the trade possible.

Salesmen of electrical goods, intended for use in the industries, call on both wholesale distributors and users. In a small percentage of instances, the manufacturers' direct representatives call only on wholesale distributors. They let the distributor do all the necessary work with the user. This particular kind of set-up, however, is poorly adapted to the industrial market. More intensive methods are required to sell articles in this field than the average supply house is able to give.

This does not mean that the supply house is not needed. It is, but it should not be expected to perform the entire selling job alone. The best organized manufacturers give their wholesalers every possible assistance. Most electrical products demand a lot of missionary work. The manufacturer is better able to do this work than is the wholesaler. After an article is once sold, however, the wholesaler's salesmen should be able to carry on future relations with the customer.

In other words, the manufacturer's salesmen are better equipped to do the pioneer work and to shoulder the burden of heavy selling, but after relations are once opened up with a user, the wholesaler should be able to represent the manufacturer, with possibly a little help occasionally from the manufacturer's salesmen.

Where an electrical manufacturer makes only a few specialties, his salesmen, as a rule, carry his complete line. The large line company, on the other hand, usually has its salesmen specialize. For instance, the General Electric Company has numerous salesmen who sell only one or at most only a few products. It has men who carry only Mazda lamps. It has others who specialize in power station equipment; still others who handle only motors.

Even the large-line organization does not have all its salesmen specialize. It is the custom to have the men working out of smaller offices, particularly in districts where industrial buyers are not so numerous, carry consolidated lines. In such cases, the salesmen often do bird-dog work. That is, they scare up prospects. Then when the prospects are on the wing, the big selling guns from the home office are brought out to bag them. Very often when a negotiation reaches this stage, technical men are sent from headquarters to reinforce the efforts of the salesman.

The electrical manufacturer's industrial selling organization, as a rule, is not large. A sales force of twenty-five or thirty men is the average

Large organizations often have free lance salesmen. They operate in all territories and out of all branches and answer only to the general sales manager of the company. Frequently these free lance artists cater to only one type of prospects, such as railroads or automobile manufacturers.

A surprising thing about the electrical manufacturer's industrial selling organization is that it is so small. The number of concerns in this field who have hundreds of

salesmen could be counted on the fingers of one hand. Even in these cases, many of these salesmen lap over into the retail end of the business. A sales force of twenty-five or thirty men seems to be about the average. Numerous companies get along with less than ten men.

The teamwork which exists between advertising and sales effort in many organizations is one reason why they are able to function with such comparatively small sales forces. Many electrical manufacturers are catering to hundreds of different industries. Their prospects in many of these industries will run up into the thousands. Obviously it would be impossible to cultivate all these prospects systematically through salesmen.

What these concerns do is to employ advertising as a missionary force. They advertise to every industry where they have reason to believe there is a market for their goods, varying the sales argument in each field, as may be necessary. As inquiries come in, they are followed up both by the manufacturer's own salesmen and by his distributor's representatives.

In this way a lot of time and much effort is saved. Instead of making a cold-turkey canvass of a blind list of prospects, the salesmen can concentrate on buyers who have already expressed interest, or on buyers whose resistance to the salesmen has been broken down by the advertising. This has been discovered to be such an economical method of marketing, that it is rapidly becoming standard practice among the more enterprising companies.

Neither straight salary nor the exclusive commission plan is regarded as the best way to pay salesmen. Earnings average slightly over $5000

Electrical goods salesmen are usually paid a salary and a commission, or a salary and a bonus, or a combination of all three. A good percentage of the salesmen get merely straight salaries; others are paid on the commission basis only. Neither the straight salary nor the exclusive commission plan is regarded as the best way to pay a salesman.

The average earnings in the business run slightly in excess of $5000 annually. Some individual salesmen, who control valuable accounts, make several times $5000. Where salaries are paid, the average runs $300 a month. Where only a commission is paid, the average approximates 8 per cent.

Few salesmen in this industry sell more than $500,000 annually. This is regarded as the maximum, although there are a few salesmen whose personal sales run into the millions. It is the custom of the industry to give salesmen full credit for all business arising in their territories, although, of course, there are exceptions to this policy. Daily expense allowances granted to salesmen, in the country as a whole, run between $6 and $8.

Nearly every electrical manufacturer has at least one branch office. The first branch is generally located in the company's most important market. At the outset, it may have only one employee—the salesman who is covering that territory. Eventually this salesman may add two or three assistants. The personnel of the average branch office is not large. It usually remains a sales office. All other activities are carried on from the home office.

In some cases territories grow to such importance that the branch office becomes an almost independent entity in the business. It supports a branch manager, a sales manager, a service manager, an accounting department, and it carries stock. The number of such branch organizations appears to be on the increase—due to the ever-growing dimensions of the electrical industry.

However, the practice of carrying complete stocks in branches is declining in recent years. One reason for this is that railroad service is so much better than it was during the war and before, that it is no longer necessary for a manufacturer to duplicate his inventory in different parts of the country. All he has to do now is to carry service parts at his branches.

Another reason is that maintaining full stocks at certain centers has been found to offer needless competition to the manufacturer's wholesale distributors, or "dealers," as they are often called in the industrial market. By eliminating sectional stocks, manufacturers are better able to give undivided cooperation to their distributors. Also it has been found that when a manufacturer gets out of the warehousing business, his supply houses will carry more complete stocks and give him more enthusiastic support than when he was competing with them.

Usually manufacturers' agents are employed when the line does not enjoy a large enough sale in a particular district for a full-time salesman

The publisher of Electrical Manufacturing defines a manufacturer's agent as follows:

"A business concern (usually an individual or firm) which represents one or more manufacturers on non-competing lines, does not buy their products outright for resale to jobber or dealer, does not carry a stock of goods, sends order and payment to manufacturer for shipment of goods direct from factory to customer, is hired by the manufacturer, and is paid by him on a salary or commission basis or both, and may or may not be limited as to territory, may or may not travel salesmen."

Manufacturers' agents operate in both the industrial and retail divisions of the electrical business. There is probably a larger number of them in the industrial division. Some of them sell both to the industries and to the retail trade, but this plan is practicable for only a very few products. As a rule, the manufacturer's agent is employed by those concerns whose goods do not enjoy a large enough sale in a particular district to justify a full-time salesman. Seemingly, almost every manufacturer uses agents of this kind in some section of the country.

The wholesaler has four principal functions: 1, to buy and to warehouse a complete stock; 2, to travel salesmen and to engage in other selling activities; 3, to fill orders; 4, to carry accounts and to make collections.

Unless a wholesaler discharges these four functions he is not a full-fledged wholesaler. The wholesaler is usually known as a "jobber." Several trades, including the electrical, are trying to substitute "wholesaler" for "jobber." In the industrial market, the "wholesale house" is generally known as a "supply house."

The industrial branch of the electrical business can be divided into two classes—those who sell through the supply house and those who do not. The latter class is a very small minority. A few manufacturers, because of the peculiar selling, installation and service requirements of their product, do not find it advantageous to deal through a middleman.

But the average manufacturer in this market does recognize the wholesaler. He may not sell his entire output through supply houses, but he sells at least a part of it in this way. The industrial market is so constituted that a manufacturer must sell both direct and through wholesalers. Large industrial buyers insist on buying their big-quantity orders direct from the manufacturer. They also want to be able to pick up their temporary and short-order needs from supply houses. There is no buyer so large, even though it be the General Motors Corporation, the New York Central Railroad Company or the United States Govern-

ment, but what it replenishes a good percentage of its supplies from wholesalers.

We know of a number of "jobbers" who, because of remarkable efficiency, a "stand-in" or for some other reason, are continually landing large orders from concerns who claim that it is their invariable policy to buy direct. It also must be remembered that this supply house is not the only wholesaler operating in this field. The general electrical wholesaler, who ordinarily caters to the retail trade, does a tremendous business in the industrial market.

We tried to obtain a break-down of the channels through which electrical products travel to the industries. The best we could do was to obtain the facts from several large manufacturers. Their industrial sales travel this way: Through wholesalers 60%; through branch houses 30%; direct from the factory 10%.

These figures are interesting, but it must be kept in mind that they do not represent the industry.

In the distribution of general electrical supplies the wholesaler stands supreme, but in selling motor-driven appliances he is losing ground

The following factors are used in distributing electrical goods through the retail trade: Manufacturers' salesmen, calling on wholesalers and dealers; manufacturers re-sale men, calling on consumers; manufacturers owning retail stores; wholesalers carrying full lines of electrical supplies; wholesalers carrying only specialties; manufacturers' agents; distributors; dealers, including central power stations and contractors.

Space does not permit a detailed discussion of the functions of all these factors and of the methods that are used by each. We can arrive at this information more quickly by considering the methods of specific manufacturers.

Two years ago Electrical Record published an article showing that about $476,000,000 worth of electrical goods are distributed through retail channels annually. Of this amount $184,000,000 is sold by the manufacturer through non-jobber channels. The remainder, $292,000,000, is sold by jobbers through various retail outlets.

In the distribution of general electrical supplies, the wholesaler stands supreme. In selling motor-driven appliances, the wholesaler seems to be steadily losing ground. The principal reason for this is that the wholesaler is not geared up to give manufacturers the selling cooperation which electrical appliances demand. Only five or six articles in this field are "bought" by the consumer. Everything else has to be "sold." The most intensive type of selling is required. To assure that his product receives this kind of selling a manufacturer cannot deal through third parties. He has to build a sales organization that is able to cope directly in the field with the industry's difficult selling problem.

It is for this reason that the factor known as a "distributor" is used so extensively in the electrical business. The publishers of this paper define a distributor as follows:

"A business concern which holds a franchise from a manufacturer for the sole selling rights in a given territory, does not carry a line or lines competing with the one on which he holds the sole selling rights, buys from the manufacturer at a discount off of the jobbers' discount, sells to jobbers or to the retail dealer or both, maintains a stock of goods from which shipment is made direct to customer, issues catalog, travels men, is financially equipped to aid customers in credit relations, and may or may not sell at retail. Differs from jobbers chiefly in respect to franchise, special territorial selling rights, and discount."

Another important difference between the jobber and the distributor is in the matter of selling intensity. The jobber handles thousands of items. Naturally he cannot give much attention to any one article. The distributor, on the other hand, carries only a few products. Sometimes he represents only one manufacturer. Hence there should scarcely be any limit to the selling effort he can give his line.

A criticism that we sometimes hear of the distributor is that he becomes too ambitious. He tries to do the whole job himself. He starts his own stores. He disregards the established electrical dealers in his community. He puts out a lot of high-pressure salesmen, who call on the householder and who try to mop up the territory quickly.

Many of the oil burner manufacturers made the mistake at the outset of appointing the wrong sort of distributors. These manufacturers made a fetich of selling their goods for spot cash. They had to get distributors who were able to pay cash, quite regardless of their other qualifications. These earlier oil burner distributors developed a hit-and-run type of selling. They sold a lot of burners, but not knowing anything about making proper installations, purchasers were often dissatisfied. The reputation of the industry was hurt.

That, however, does not condemn the distributor system. Properly handled, marketing through distributors is one of the most efficient and most economical methods of selling an electrical appliance. The oil burner people, themselves, have discovered that their earlier methods were unsound. They are still using distributors, but these distributors are now working through dealers. The distributor stocks the burners and handles the deferred payment paper.

As a general thing, the oil-burner distributor gets a discount of 40 per cent from list prices. He gives 25 per cent to his dealers. In those cases where he has to sell the burners for them, he gives them only 20 per cent. This plan is used extensively in the electric appliance field.

Many appliance manufacturing companies maintain a string of retail outlets to handle their lines. Such outlets are really branches

Another marketing arrangement that has great vogue in this field at present is the manufacturers' own stores. Many appliance companies maintain quite a string of retail outlets in which only their own products are offered. While these establishments are known as stores, they are really branch offices. Not many customers visit them. They serve as a sort of coaling station for the salesmen.

One of the most successful of all the appliance manufacturers sells his goods through electrical dealers and through his own stores.

One reason why manufacturers start their own stores is that there is such a scramble among electrical manufacturers to get dealers that there isn't enough to go round. There may be three electrical dealers in a town, with seven washer manufacturers trying to get representation in that place. Four of those washer concerns will have to make arrangements that may be considerably short of what they would like to make.

A tie-up with an established dealer is always the best way to market an electrical appliance. One of the most outstanding successful manufacturers in the United States happens to be in the appliance field. He attributes his success to his close affiliation with the retailer. He has never sold a dollar's worth of goods, except through his dealers.

The methods of this manufacturer will be discussed in detail in the concluding article of this series, which will appear in an early issue of Electrical Manufacturing. In that article we will attempt to lay out an ideal marketing plan for the electrical manufacturer.

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

Edison Enters Radio Field With Splitdorf

Walter Rautenstrauch, president of Splitdorf-Bethlehem Electrical Company, has announced that Thomas A. Edison, Inc., and the Splitdorf Company have formed an association of interest to manufacture and merchandise electric radio receivers and electric phonographs.

The company will operate under the combined Splitdorf and Edison patents and under license of the Radio Corporation of America and its allied companies. Both the Edison and Splitdorf companies will retain their respective identities.

Charles Edison, son of the inventor, and other directors of the Edison company, will become directors of Splitdorf. Charles M. Schwab, the steel magnate, is a director of Splitdorf; his brother, Edward H. Schwab, is chairman of the board. Mr. Rautenstrauch will become consulting engineer for Thomas A. Edison, Inc.

Plants of the Edison company at Orange, N. J., are said to be valued at more than $7,000,000. Splitdorf has assets of $6,318,000, according to the latest balance sheet available, and operates plants at Newark, Bethlehem, Pa., Detroit, Cedarburg, Wis., and Toronto.

Coe Heads Cleveland Office of Electrical Tool Company

H. O. Coe

H. O. Coe, prominent in the electrical jobbing business in Ohio for the last 14 years, has been appointed manager of the Cleveland office of the United States Electrical Tool Company of Cincinnati. Mr. Coe was in the sales division of W. Bingham Company, Cleveland, for eight years, having been engaged in the retail hardware business six years previous to this.

Maytag Company Institutes New Shipment Policy

The Maytag Company's plan entitling division and district managers to receiving commissions when clothes washers were shipped from the factory, has given way to a new shipment policy. Tendency of the old system to overstock dealers has led to a plan whereby division and district managers receive a commission only when machines actually are sold at retail, all of which sales are reported to and checked by the company. During the first quarter of the present year, reports show that there was a falling off in sales and earnings of the Maytag Company, due to this change, but it is understood that estimated retail sales of machines ran ahead of last year. Retail sales in the current quarter are said to be level with those of the same period a year ago, and present indications are that 1928 will approach the record year of 1926.

Acme Wire Elects T. G. Nee President and Director

Thomas G. Nee has been named president of the Acme Wire Company, New Haven, Conn., succeeding Victor M. Tyler, retired. He also was elected a member of the board of directors to replace James T. Moran, who resigned. William G. Redfield, president of the New Haven Bank, was made a member of the board to succeed James E. Wheeler, resigned. James W. Hook, president of the Geometric Tool Company, New Haven, was elected chairman of the executive committee.

Thomas G. Nee

Mr. Nee is a graduate of the University of Wisconsin. He was vice-president and chief engineer in charge of operations of the Mexican Telephone & Telegraph Company from 1905 to 1917. From 1917 until 1927, he was president of the Horne Company, Limited, Japan, a subsidiary of the Allied Machinery Company, New York.

H. E. McEldowney Elected Director of G. E. Co.

Henry C. McEldowney, president of the Union Savings Bank and Union Trust Company, Pittsburgh, has been elected a director of the General Electric Company. This increases the number of directors to twenty-one. Mr. McEldowney is a director of the Mellon National Bank of Pittsburgh.

A-C Dayton Acquires Flewelling Rights

A-C Dayton Company, Dayton, Ohio, in conjunction with Radio Products Company, has acquired the sole right of manufacture in this country of the Flewelling short wave adapter, making possible the reception of intercontinental radio programs here. E. T. Flewelling, who perfected the device, is the new consultant and development engineer of the company.

Osborne Re-elected Head of Industrial Board

Loyall A. Osborne, president of Westinghouse Electric International Company, was re-elected chairman of the National Industrial Conference Board at its twelfth annual meeting in New York. Fred I. Kent, director of the Bankers Trust Company, was re-elected treasurer.

L. A. Osborne

Magnus W. Alexander, who continues as president and chief executive of the organization, said of Mr. Osborne:

"He is not only a prominent figure in the electrical industry, but has gained international recognition for the excellence of his work in broader fields. He was appointed a member of the National War Labor Board; he has been twice decorated by the Emperor of Japan for his constructive technical work in that country; and he has been made Commendatore of the Order of the Crown of Italy for his contributions to Italian educational progress.

"The members of the board are gratified that they will have the benefit of his services for a third year."

General Electric Constructs Two Buildings by Welding

General Electric Company has taken a second step in its program of utilizing arc welding in the construction of new buildings, with the announcement that an addition to its Bridgeport, Conn., plant and a building at its Pittsfield, Mass., plant are being completed by that process.

The first General Electric welded building was erected in Philadelphia as an addition to the switchgear manufacturing plant. Its completion was chiefly notable because of the large number of welded trusses used in the roof structure, and the fact that this was the largest steel structure ever welded.

Amended National Code Nears Final Form

The executive committee of the National Fire Protection Association meets late in June to receive the results of a letter ballot by the electrical committee membership on the final draft of the proposed text of the 1928 National Electrical Code as drawn up by the electrical committee at its Atlantic City meeting, held in

May. After its June meeting the executive committee will recommend adoption and publication of the amended Code by the National Board of Fire Underwriters and its approval as an American standard by the American Engineering Standards Committee.

Standardization Work Under Way Is Listed

The 1928 year book of the American Engineering Standards Committee, issued on June 4, shows these standardization projects under way:

Rating of electrical machinery; make-ups for rubber insulated wires; impregnated paper cable; varnished cloth insulation; fibrous and metallic coverings; weather-proof, heat-resisting and similar wires; radio; miscellaneous line materials; line insulators; D. C. rotating machines; alternators, synchronous motors and machines; induction motors and machines; fractional horsepower motors; switch and outlet boxes; frame dimensions of motors; electric arc welding apparatus; resistance welding apparatus; mercury arc rectifiers; oil circuit breakers; disconnecting and horn gap switches; electrical measuring instruments; storage batteries.

Standards soon to be issued include: 30 per cent rubber insulation for wire and cable for general purposes; cotton covered, silk covered and enameled round copper magnet wire; code for electricity meters; dry cells and batteries.

Specifications and standards will also be worked out for performance and inspection covering fire or casualty hazards of devices and materials employed in installations of electric wiring to which the National Electrical Code and the National Electrical Safety Code apply.

Lindbergh Beacon in Use on Los Angeles Tower

Lindbergh Beacon, erected as a monument to Col. Charles A. Lindbergh and presented to him by the people of Los Angeles, is now in use on the Los Angeles city hall tower. The 8,000,000-candlepower airport light, made by the General Electric Company, was switched on by President Coolidge in Washington.

The beacon is lighted by a 900-watt filament lamp, burning before a 24-inch mirror, the beams pouring through a 24-inch lens. The reflecting mirror is so designed as to throw a concentrated beam of light that can be seen a distance of 60 miles in fair weather. The beacon revolves six times a minute.

National Carbon Company Enters Radio Field

National Carbon Company, Inc., has entered the radio receiving set field, manufacturing both A.C. and battery-operated types.

A die-cast aluminum receiver features the line. It has been discovered that aluminum can be molded into the same contours that distinguish wood products, and that painting by the baking process results in a finish which cannot be marred, it is said, by dust, smoke, grease, or water.

Marketing of the new receiving sets by the National Carbon Company will be done under the trade name of Eveready.

Edison Awarded 1928 Medal of Science Society

For the first time in its forty-six years of existence, the Society of Arts and Sciences recognized a living scientist when, on May 24, Thomas Edison was awarded the 1928 Gold Medal for Science. The medal, bearing a portrait of Mr. Edison, was accepted by Charles Edison, son of the inventor, at a dinner in the Hotel Astor, New York City.

Mr. Edison read this letter of acceptance from his father, who is on his plantation at Fort Meyers, Fla.:

"When I recall the name of Herbert Spencer, the illustrious founder of your society, and the aims and objects of its existence, it seems to me a matter of justifiable pride that the officers and membership should do me the signal honor of presenting me with its gold medal and award for what it has been pleased to term 'scientific achievement.' It is a source of much gratification to me to learn that this presentation has received the approval of so many of my friends."

The 1928 Gold Medal for Science, awarded to Thomas A. Edison by the Society of Arts and Sciences, and accepted for him, in his absence, by his son, Charles Edison

W. D. Lindsey Is Elected President of Garrison

W. D. Lindsey has been elected president of Garrison Fire Detecting System, Inc., 79 Madison Avenue, New York City. Mr. Lindsey was formerly executive vice-president and has been with the corporation since its inception in 1925. He succeeds Richard T. Merrick, who died on March 28, 1928.

W. D. Lindsey

Mr. Lindsey spent fifteen years in the service of Western Electric Company, first as an engineer and later as an advertising man. He left that company to take up advertising agency work, and became associated with Evans, Kipp & Hackett.

Lighting Equipment Show Held in Chicago

Many manufacturers of lighting equipment are displaying their lines at the national exhibition being held June 11-16 at Hotel Sherman, Chicago, in conjunction with the annual convention of the Artistic Lighting Equipment Association. In addition to general sessions the convention includes meetings of the stamping and parts manufacturers group, the exterior lighting and lantern manufacturers group, the manufacturers selling through jobbers group and the floor and table lamp manufacturers group.

Alden Company Creates Two New Divisions

Alden Manufacturing Company, Brockton, Mass., has created two new divisions. In the new custom molding division the work will not be restricted to radio, as heretofore, but all kinds of custom molding, up to certain sizes, will be undertaken.

An assembling division, undertaking light assembly work, of any kind in quantity, is also established. New equipment will lower labor costs as much as 70 per cent, it is estimated.

Sleeper Acquires Control of Mu-Rad Corporation

Sleeper Radio and Manufacturing Corporation has acquired control of the Mu-Rad Radio Corporation, common stock control of the former being transferred to Mu-Rad. Under the merger agreement, Mu-Rad becomes the holding company and Sleeper the manufacturing and operating company. Gordon C. Sleeper is president, with H. C. Doyle acting as treasurer of both corporations.

Jensen Radio Company Opens Chicago Plant

Jensen Radio Manufacturing Company, Oakland, Cal., has opened a manufacturing plant on the West Side of Chicago for making and assembling Jensen dynamic cone speakers for dealers and set manufacturers. Thos. A. White is sales manager.

Owens Wins Lincoln Arc Welding Award

James W. Owens, director of welding for the Newport News Shipbuilding and Drydock Company, Newport News, Va., was awarded first prize of $10,000 in the arc welding contest conducted by the Lincoln Electric Company, Cleveland. Mr. Owens, past vice-president of the American Welding Society and a fellow of the American Institute of Electrical Engineers, is author of "Fundamentals of Welding."

James W. Owens

Eleven judges, representing the American Welding Society, American Institute of Electrical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, and the Bureau of Standards, cast a unanimous vote for Mr. Owens. In all, 77 papers were submitted from the United States and foreign countries, but only eleven reached the judges, the others being eliminated at the outset of the contest.

General Radio Withdraws All Distributors

General Radio Company, Cambridge, Mass., will discontinue all distribution outlets on July 1, due to a change in the product manufactured. As the major part of its output is now in laboratory apparatus, promoting a factory-to-consumer trade, the company has decided to place all of its output on the same basis.

Development and manufacture of radio parts will not be discontinued, but in the future all such parts, as well as laboratory apparatus, will be sold direct to the consumer. To facilitate distribution, West coast stock will be maintained in San Francisco, while Chicago will have a similar station.

Consolidated Lamp Buys Creighton Shoe Plant

Consolidated Electric Lamp Company, Danvers, Mass., has purchased the shoe plant of the A. M. Creighton Company, Lynn, Mass., and will start operations July 1. All equipment of the Consolidated company will be moved from Danvers, and additional new machinery will be installed. It is expected 500 men will be employed. The plant will occupy 100,000 sq. ft. and will be devoted to the manufacture of incandescent lamps, radio tubes and electric heating units.

Electrical Laboratories Plan for Motor Testing

Electrical Testing Laboratories, New York, is undertaking a program of testing fractional horsepower single-phase motors in an effort to determine their operating characteristics and whether they comply with the specifications set up last winter by the Joint Committee on Fractional Horsepower Motors.

Central stations interested in the project are underwriting the expense of the program, and motor manufacturers have been invited to submit samples of their products for test without cost. Copies of the comprehensive reports covering all motors on the market are to be made available only to central stations ordering the tests.

Arthur D. Dana, Former Fuse Company Head, Dies

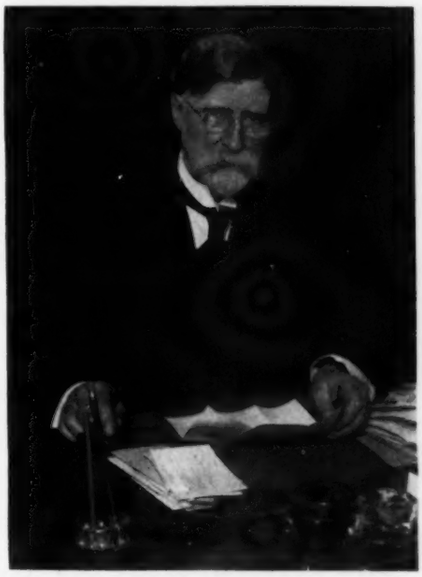
Arthur Dwight Dana, 67, pioneer manufacturer of electrical equipment, who organized and was president of the Chicago Fuse Manufacturing Company, died May 26, at his home in New York, after a long illness. He was associated with Elmer A. Sperry, the inventor, in the formation of the Sperry Electrical Company and was later a director of the Sperry Gyroscope Company.

Mr. Dana was head of the Chicago Fuse Manufacturing Company from 1896 until he retired in 1924. He formerly owned the Moore Drop Forging Company of Springfield, Mass., and was a member of the executive committee of the Goodman Manufacturing Company, Chicago.

Paul T. Brady, Engineer, Dies of Heart Failure

Paul T. Brady, aged 71, associated with the Westinghouse Electric & Manufacturing Company for 34 years, and actively engaged in the electrical industry since 1881, died of heart failure on May 3 at the home of his son, Arthur J. Brady, in Portland, Ore. Funeral services were held at his home, 1041 Palisade Avenue, Palisade, N. J., on May 9. He is survived by his widow, Sarah Begley Brady, five sons and five daughters.

Mr. Brady was born in Cooperstown, N. Y., in 1856. He became associated with the American Telephone & Telegraph Company in 1881, and was instrumental in extending the telephone system through the southeastern portion of New York State. He built some of the first electric light plants in that district. Later he joined the Thomson-Houston company, which became part of the General Electric Company.



Paul T. Brady

In 1894, he took the position of New York State manager of the Westinghouse company, with headquarters in Syracuse. In 1907 he was transferred to New York City as special representative, which position he retained until his death.

Charles G. Washburn, 71, who was instrumental in developing the Washburn & Moen Manufacturing Company, at present the Worcester, Mass., works of the American Steel & Wire Company, died May 25, at Lenox, Mass., while attending an Episcopal conference. He established the Wire Goods Manufacturing Company, now the Washburn Company.

John B. Thomas, prominently identified with Westinghouse Electric & Manufacturing Company for 52 years, died recently at his home in Pittsburgh. He was sent to Paris in 1886 by George Westinghouse to manage the French branch of the air-brake company.

Brevities

The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., announces the opening of an office at 10 High Street, Boston. Frank W. Garner is in charge as district sales manager.

American Lighting Products Co., Cleveland, Ohio, is the new name of the Crescent Brass Products Co. The company is now under the management of Charles J. Moran, with J. O. Cerny as shop superintendent.

"Double Action" Electric Company has moved into new headquarters at 30 Michigan Street, Grand Rapids, Mich. The new location gives the company the facilities to increase production at least 50 per cent. All modern equipment of latest design has been installed.

Mogadore Insulator Co., Mogadore, Ohio, has changed its name to Akron Porcelain Co. Offices are now located at Cory Avenue, Kenmore, Akron, Ohio.

Raytheon Manufacturing Company, Cambridge, Mass., announces the election of Fred D. Williams as vice-president. Mr. Williams is president of the Dubilier Condenser Corporation, New York, which position he continues to hold in an executive advisory capacity.

Pacent Electric Company, New York, has appointed George Soule as assistant sales manager.

Westinghouse Lamp Company has awarded prizes totaling $1,000 to three of its young engineers, Allen B. Du Mont, Luther Davis and Charles W. Hunt.

Erie Malleable Iron Company announces that C. E. Collier has been placed in charge of its western office, 911 Peoples Gas Building, Chicago.

Westinghouse Electric & Manufactur-

ing Company announces the appointment of Samuel A. Curry as Superintendent of Inspection and Test at the South Philadelphia Works. Mr. Curry, who was formerly Field Engineer and Turbine Test Engineer, fills a vacancy left by the death of John T. Snyder. He will be succeeded by U. A. Taddiken.

Stewart Battery Company, 119 Peoria Street, Chicago, announces a new name —Stewart Industries, Inc.

Insulated Duct & Cable Company is the new name of the Middlesex Manufacturing Company, Homestead and Stokes Avenue, Trenton, N. J.

Kodel Electric & Manufacturing Company is the new name of Kodel Radio Corporation, Cincinnati.

Morgan - Wayman Manufacturing Company has been formed for the manufacture of switch boxes. It is located at 415 West Street, Youngstown, Ohio.

General Kontrolar Company, 200 East First Street, Dayton, Ohio, has been organized to manufacture sign flashers and mercury flashers.

Claude-Neon Lights of Maryland, Inc., Maryland representative of Claude Neon Lights, Inc., has opened a plant in Baltimore.

Buffalo Foundry & Machine Company, manufacturer of vacuum dryers, evaporators and chemical apparatus, has appointed O. S. Sleeper as engineer in charge of special development work.

Maytag Company has voted to recapitalize. Authorized stock consists of 200,000 shares of cumulative $6 first preferred, 320,000 of cumulative preferred, and 2,400,000 shares of common, all of no par value.

Stewart Die Casting Company, Chicago, has produced an eighteen page booklet entitled, "A Story of Parts," illustrating die cast fittings. A double page is devoted to scenes taken at the Stewart plant in Chicago.

National Electric Products Corporation has been formed to acquire the business of National Metal Moulding Company, American Copper Products Corporation and British American Metals Company.

Henry L. Crowley & Company has been formed to manufacture ceramic products. Factory and offices are at 545 North Arlington Avenue, East Orange, N. J.

Williams Oil-O-Matic Heating Corporation will hold the fourth international convention of its representatives and personnel at Bloomington, Ill., June 25 and 26.

Ingersoll-Rand Drill Company, 314 North Broadway, St. Louis, Mo., has been succeeded by Ingersoll-Rand, Inc. A new branch operating under the St. Louis offices has been opened at 226 West A Street, Picher, Okla.

Crosley Radio Corporation, Cincinnati, Ohio, has purchased radio broadcasting station WSAI. Hereafter the company will operate it in addition to its regular station, WLW. Both stations now operate at 5000 watts. Mr. Crosley is planning to install 50,000-watt equipment in WSAI.

Coming Conventions

American Society of Heating and Ventilating Engineers
Semi-annual meeting, June 26-29, West Baden Springs

Artistic Lighting Equipment Association
Annual convention and exhibition, June 11-16, Chicago

Association of Electragists International
Annual convention and exhibition, Aug. 6-11, Chicago

Electrical Manufacturers Club
Oct. 24-27, Westchester-Biltmore Country Club, Rye, N. Y.

National Electrical Credit Association
Annual meeting, July 16-17, Boston, Mass.

National Electrical Manufacturers Association
Annual convention, June 11-15, Hot Springs, Va.
Policies Division, July 29-Aug. 1, Association Island, N. Y.

Radio Manufacturers Association
Annual Trade show, June 11-15, Chicago

Personals

R. W. Wales has been appointed factory representative on molding powders and resins of the Celoron Company, a division of the Diamond State Fibre Company, at Bridgeport, Pa. The company has opened a new laboratory and is making molding compounds.

James J. Nolan has been appointed Western Division Manager of the Amrad Corporation with headquarters in Chicago.

William H. Yawger, vice-president and treasurer of Weston Electrical Instrument Corporation, Newark, N. J., has resigned from active duty because of ill health.

F. C. Allen, Jr., has resigned the presidency of Allen & Billmyre Company, Inc., to become head of the Allen Air Appliance Company, 452 Lexington Avenue, New York. He was the founder of Allen & Billmyre Company.

Charles E. Tullar, assistant manager of the patent department, General Electric Company, has been appointed manager to succeed A. D. Lunt, deceased.

Gordon E. Bloom has been appointed field sales director of the Refrigerator Division, Benjamin Electric Mfg. Company, Chicago.

A. W. Kakitty has become associated with the Illuminating Engineering Department, Benjamin Electric Mfg. Company, Chicago. He was formerly illuminating engineer with National Lamp Works, General Electric Company, Nela Park, Cleveland.

T. P. Brown, formerly Street Lighting Specialist of the Engineering Department, Edison Lamp Works, General Electric Company, Harrison, N. J., has been transferred to the East Central District as district lighting engineer with headquarters in Cleveland.

Leslie G. Thomas has been appointed factory manager of Polymet Manufacturing Corporation, manufacturer of power supply equipment. He was formerly factory manager of the F. A. D. Andrea Company, Inc., radio manufacturers, and works manager of Freed-Eisemann Corporation.

Alexander Nyman, for five years consulting engineer with Dubilier Condenser Corporation, New York, has sailed for Europe to study European radio conditions and technical developments, spending some time with the British and German Dubilier organizations.

Clarence A. Earl has been elected president of the Chas. Freshman Company, Inc., New York.

Lightolier Company, 569 Broadway, New York City, has named M. D. Blitzer to succeed his father, the late Bernhard Blitzer. Mr. Blitzer was formerly vice-president in charge of general operations.

Hugh Silcott, formerly with One Minute Manufacturing Company, is now sales manager of Haag Brothers Company, 812 North Commercial Street, Peoria, Ill., manufacturer of electric clothes washers.

M. J. Adler has been appointed advertising manager of Freed-Eisemann Radio Corporation, Junius Street and Liberty Avenue, Brooklyn, N. Y., to succeed Ray L. Speicher, who has been advanced to a position in the promotion department.

John G. Wolfe has been appointed credit manager of North American Radio Corporation, New York.

Removals

American Insulated Wire Division, General Cable Corporation, Chicago office to 1026 Bankers Building, Adams and Clark Streets.

Bremer-Tully Manufacturing Co., from 520 South Canal Street to 656 Washington Boulevard, Chicago.

Buckingham Radio Corporation, from 25 East Austin Avenue, to 440 West Superior Street, Chicago.

Jensen Radio Manufacturing Co., Chicago office, from 35 East Wacker Drive, to 338 North Kedzie Avenue. Oakland abandoned.

Kelvinator Sales Corporation, from 565 West Washington Boulevard, to the new De Paul Building, 64 East Lake Street, Chicago.

Lexington Electric Products Company, from 419 East Twenty-fourth Street, New York, to 12 Chapel Street, Newark, N. J.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City.

"Corona" Fireless Cooker.
"Splendida" Electric Iron.
"Sal. Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Aimco" Factory Horn.
"Wharton" Battery Charger.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Blaisdell" Automatic Electric Cigar Lighter.

Arnold Bath Cabinet asked for in our May issue is manufactured by Edward W. Arnold, Logansport, Ind.

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Manufacturers Convene Again at The Homestead

Nema is holding its annual meeting June 11-16 at Hot Springs, Va., where, a score of years ago, electrical manufacturers who had been called together by S. L. Nicholson organized the beginning of what is now the National Electrical Manufacturers Association.

The various sections of the supply, apparatus and appliance divisions hold sessions at The Homestead through the week. The industrial lighting section met on June 6, the standards committee on the 9th, and the law committee and advisory committee of the motor and generator section on the 11th.

Radio Division Holds Meeting at Chicago

Recent congressional legislation, advertising and public relations, price maintenance, television, credit service, manufacturers' problems with dealers, and the effect of standardization on the industry were among the subjects discussed at the conference of the radio division, held at Drake Hotel, Chicago, June 4-7.

Louis B. F. Raycroft, vice-president of the association, denounced political control of radio. He believed that "the political control of radio in the next two years will so restrict radio as to limit public demand and interest in it, and have a serious bearing on the sales of radio apparatus.

The statistical division showed copies of a statistical study of the radio market. A step toward improving radio satisfaction with every receiver owner was announced in the form of a course of technical and practical instruction for radio service men throughout the country, to be called the Nema Radio Service Men's Course. This was announced by R. L. Duncan, director, Radio Institute of America, who prepared the course in cooperation with Nema.

Trade-in value of radio sets was discussed by H. Curtis Abbott, general sales manager, Crosley Radio Corporation, and Mr. Raycroft announced that within a few months the Nema handbook of radio trade-in values would be published for use by dealers throughout the country.

The operation of a nation-wide credit service was explained by Frederick P. Vose, of the National Electrical Credit Association. Alfred N. Goldsmith discussed cooperation between the Institute of Radio Engineers and Nema.

Other speakers included: Thomas F. Logan, president, Lord & Thomas & Logan; R. H. Manson, chief engineer, Stromberg-Carlson Telephone Manufacturing Company; Dr. Herbert E. Ives, special research engineer, Bell Laboratories, Inc.; Dr. L. R. Koller, General Electric Company; L. G. Baldwin, general sales manager, Willard Storage Battery Company.

Apparatus Standards Handbook Ready

Under the title of the Nema Handbook of Apparatus Standards, the association is reissuing the Electric Power Club Handbook of Standards. This is the first issue since September, 1925, and it incorporates all standards and recommended practices for the manufacture and performance of electrical apparatus adopted by the National Electrical Manufacturers Association to date. Members will receive one free copy. Additional copies will be $1.50. The price to non-members is $3.00.

Representatives to Study System Voltages

The following representatives have been appointed on the joint committee with the N. E. L. A. on system voltages:

F. C. Hanker, H. R. Summerhayes, L. C. Nichols, E. H. Jacobs, G. A. Sawin.

Mr. Hanker is chairman of the Nema representatives. The N. E. L. A. representatives are:

A. L. Harding, S. M. Jones, H. R. Woodrow, H. C. Sutton, W. F. Davidson, Alexander Maxwell, alternate.

Moeller Is Appointed

R. C. Moeller, Collyer Insulated Wire Company, representing the flexible cord section, has been appointed a representative on the sectional committee on standardization of wire and sheet metal gages.

New Members Admitted

Radio Division: American Electric Switch Corporation, Minerva, Ohio, J. C. Lewis, executive.

Carbon Section: Stackpole Carbon Company, St. Marys, Pa., Lule G. Hall, executive; H. S. Conrad, associate. Morganite Brush Co., Inc., Long Island City, N. Y., H. C. Mills, executive. Graphite Metallizing Co., Yonkers, N. Y., F. P. Fuller, executive. U. S. Graphite Co., Saginaw, Mich., Charles W. Adams, executive; A. S. Harvey, associate.

Molded Products Section: Chicago Molded Products Corp., Chicago, Edward F. Bachner, executive; E. & M. Schneider Co., Chicago, A. B. Schneider, executive.

Armored Conductor and Metallic Flexible Conduit Section: Circle Flexible Conduit Co., Brooklyn, N. Y., M. Cohan, executive; Solomon Furst, associate. Standard Flexible Electric Cable Corp., Long Island City, N. Y., Edward M. Rosenfield, executive; Julius Rosenfield, associate.

Flexible Cord Section: Holyoke Co., Inc., New York City, H. T. Smethurst, executive; J. S. Miller, associate.

Attachment Plug Section: Utilo Mfg. Co., Inc., Lancaster, Pa., Harry V. Nyce, executive.

Standards Committee News

M. A. Chapman, Mica Insulator Company, has been appointed to serve as a representative of the supply division on the standards committee.

The report of the joint committee on definitions, abbreviations and nomenclature, with recommendations on disconnecting switch definitions of the switchgear section, has been referred to that section for its approval.

The proposed change in wording of Rules 216-229 and 216-241 of the attachment plug section, which had been approved by letter ballot of the section, was approved by the standards committee.

The proposed standard tolerances on ID and OD for rectangular phenolic tubing, approved by the laminated phenolic products section as a standard, was approved by the standards committee.

A joint sections committee, representing the flexible cord section, heater cord group, fan motor section, heating appliance section, and radio division, was appointed to review the standards on flexible cord and heater cord.

A number of standards adopted by the radio division have been approved for printing by the standards committee.

The question of troughing standards for boxing wire ways was referred to the casualty and fire prevention committee.

The U. S. Bureau of Standards proposes to call, at an early date, a conference of representatives of interested organizations on questions relating to the principal electrical units and measurements. The bureau has membership in the committee handling this subject under the auspices of the International Committee on Weights and Measures, which is to report by March 1, 1929. If it is found that the association is interested in this matter, the standards committee will authorize W. J. Canada to attend the meeting.

H. S. White, Fretz-Moon Tube Company, representing the rigid conduit section, and Adnah McMurtrie, Thomas & Betts Company, representing the conduit fittings section, have been appointed representatives on the sectional committee on standardization of pipe threads.

L. F. Adams, General Electric Company, was appointed a representative on the safety code correlating committee.

Refrigeration Manufacturers Plan a National Association

Representatives of thirty-one manufacturers of refrigeration apparatus met at Detroit, May 9, and drew up a council constitution and by-laws

REPRESENTATIVES of thirty-one companies which manufacture electric refrigeration equipment or are associated with the industry met at the Detroit Athletic Club, Detroit, Mich., May 9, and, after an all day session, decided to form a refrigeration association. The meeting was sponsored by the National Electrical Manufacturers Association. A. E. Waller of Nema opened the meeting by describing the advantages that would result from organizing.

The following resolutions were adopted:

"Resolved, that we hereby declare ourselves associated in a Refrigeration Manufacturers Council, to become a permanently organized group as soon as possible.

"Resolved, that it is the sense of the meeting that we tentatively endorse the proposal to become a Division of the National Electrical Manufacturers Association, pending preliminary negotiations and a decision as to whether we may be acceptable to the National Manufacturers Association as a Division."

It was felt that it would be an advantage to organize as a division of Nema because of the experience of that organization, its facilities for carrying on the work of standardization and for the collection of statistics, and its promotion of uniform codes and ordinances. It was brought out that joining Nema would not curtail the authority of the group, as every division of Nema is autonomous, having its own officers.

The members decided first to organize as a body, and then to make application to Nema for admission as a division. A constitution and by-laws which had been prepared for the Electric Refrigeration Council in 1926, when such an organization was under consideration, was then studied and changed to fit the needs of the new group. This was read section by section and adopted.

It was decided to make the organization effective when the constitution and by-laws had been adopted by ten or more eligible companies.

C. K. Woodbridge, Kelvinator Corporation, was elected president of the Council; T. K Quinn, General Electric Company, vice-president; Howard E. Blood, Norge Corporation, secretary; George W. Mason, Copeland Products, Inc., treasurer. Of nine directors, five were elected as follows: C. K. Woodbridge, T. K. Quinn, George W. Mason, Frank E. Smith, and E. B. Mallory. Mr. Smith is with Servel, Inc., and Mr. Mallory with Climax Electrical Refrigerating Company.

Objects of the Council

AN entrance fee of $100 per company was provided for in order to give the council working funds. This will be applied to the dues when the organization becomes effective. A resolution was passed thanking A. E. Waller and S. N. Clarkson for taking the initiative in calling the meeting and in acting in an advisory capacity.

The constitution provided that "The objects of this Council shall be:

"To promote and further the interests of the manufacturers of refrigeration in all its industrial problems.

"To promote standardization of refrigeration apparatus.

"To collect and disseminate information of value to its members or to the public.

"To appear for its members before legislative committees, governmental bureaus and other bodies in regard to matters affecting the industry. To promote a spirit of cooperation among its members for the improved production, proper use and increased distribution of refrigeration apparatus. To increase the use and improve the quality of refrigeration service."

Above to the left is C. King Woodbridge, Kelvinator Corporation, president of the Council. Above to the right is T. K. Quinn, refrigerator division of the General Electric Company, vice-president. To the left is Howard E. Blood, Norge Corporation, secretary. To the right is George W. Mason, Copeland Products, Inc., who is treasurer

How Electric Welding Effects *Plant Economies*

The use of electric arc welding is becoming widespread in industrial plants in the manufacture of structural steel products

In structural fabrication the electric arc welder simplifies design and eliminates many small parts, such as gussets and shelf angles. This, in turn, reduces costs to a great extent

ELECTRIC welding, due to the economies it effects in the cost of construction methods, is coming into widespread use in manufacturing plants. Recently it has been found practicable to cut mild steel into the most intricate structures by means of the electric welder. This replaces cast iron which was used heretofore because it was for a great many years the only material that could be made into the requisite shapes.

The use of the electric welder in structural work brings about: a saving of material, a saving of labor, a reduction of machining operations, an increase of strength, a reduction in weight, and a substantial reduction in overhead costs and carrying charges.

The present day trend of retail prices is downward. The manufacturer in order to meet this and yet to make a profit must institute production savings. It is this fight to create more economies that has brought about the sudden development of the electric welding process.

It is estimated by the Lincoln Electric Company that the cost of welding one-half inch plates, including operator's time, electric current and carbon electrodes, will not exceed three to seven cents per running foot of weld. The cost of welding plates of other thicknesses is in direct proportion to this.

A machine turntable base was recently made from steel by means of the electric welder. Its weight was 1740 lb. and it cost $105. A similar one constructed of cast iron cost $336 and weighed 4200 lb. The first cost saving by the welding method was $231. Also, the welded one weighed 2460 lb. less and therefore was much easier to handle and less costly to operate.

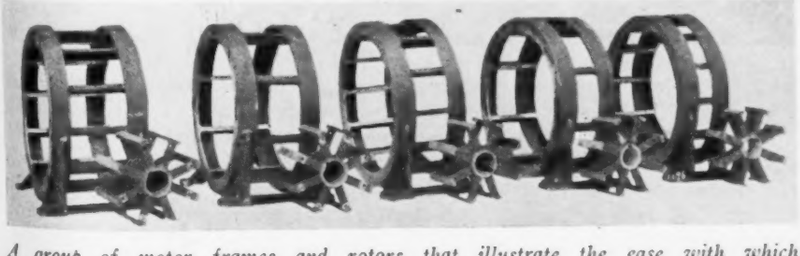
Electric welding has two distinct uses in the industrial plant. If the manufactured product is steel or iron in frame or structure, it can probably be made by use of the welder. In case that the company is erecting new buildings in its plant, the girders and trusses can be welded together instead of being riveted.

In building construction, the welding method is most economical because of the number of pounds of steel that are made unnecessary by the elimination of gussets. Welding is particularly helpful in the erection of additions to existing buildings, for old members can be added by the simple process of uncovering the old steel girders at the points where connections are to be made.

For manufacturing processes, the comparison of cast iron and welded steel is as follows: gray iron castings cost on the average of five or six cents per pound; steel from two to two and one-half cents per pound. To use cast iron, means a big investment in foundry equipment, patterns and buildings. It means the carrying of a large stock of current and superseded parts, and the tying up of working capital in things which are only of intermittent use. To use electrically-welded steel, involves no such expense. The only capital investment needed is for welding equipment and a stock of structural shapes in standard use.

In actual practice, it has been conclusively demonstrated by one manufacturer that his inventory of steel is less than 11 per cent of the amount he formerly had tied up in iron castings and patterns. It also has been shown that the average manufacturer can double production in critical departments by using electric welding because of the space he has gained by the elimination of foundry floor space, pattern storage, etc.

The strength of welded joints has been proved. The Lincoln Electric Company has welded bars and then twisted them through 1080 degrees, three complete revolutions, without the welded portions showing any signs whatever of failure.



A group of motor frames and rotors that illustrate the ease with which even the most intricate forms of construction can be accomplished by electric welding. Tests have shown that the welds have as great ductility and strength as equivalent sections of mild steel

By Keeping Labor Turnover Negligible, This Company Is

ACHIEVING *Quality Repair Work*

The motor repair department of the Public Service Company of New Jersey requires finished work to undergo a series of severe tests

BY H. L. HOLCOMB
Associate Editor
ELECTRICAL MANUFACTURING

H. A. Benedict, mechanical engineer, Public Service Coordinated Transport Co., a subsidiary of the Public Service Company of New Jersey

An interview with
H. A. BENEDICT
Mechanical Engineer
Public Service Coordinated Transport Company

ARMATURES and field coils rewound in the repair shop of the Public Service Company of New Jersey must stand even more rigid tests than those to which new apparatus is subjected by manufacturing companies.

"Operating companies like ours, which have equipment exposed to all kinds of weather, meet conditions that are never encountered by the motor manufacturing companies," explained H. A. Benedict, mechanical engineer of the Public Service Coordinated Transport Company. The trolley cars of the company must be kept moving through snow, rain and slush—sometimes up to their hubs in water with the field coils of their motors partially submerged.

Only a repair shop that is well organized, that is equipped with the most modern machinery and that is operated with the most skilled labor could handle the work required of it under such conditions. The New Jersey company's repair department, which has been in operation for eighteen years, meets all of these severe requirements.

There are ten employees in the repair department of the company. "Years ago the shop was even larger than it is now," stated Mr. Benedict. The reason for the lowering of the number of employees required in this department is that better equipment is now being manufactured than before and also the repair department has learned to make better repairs than it could possibly do a number of years ago. As the work keeps coming in steadily, the repair shop is run on a very economical basis.

Practically all of the ten employees of this department are seasoned repair men. The turnover in labor is almost non-existent. For this reason there is no fixed policy for breaking in new men. Years ago, when the shop was younger and the personnel was less stable, the company used to hire a number of apprentices who learned the work from the very beginning. A great number of the men now in the department advanced themselves from such apprenticeships.

The Public Service Company is extremely fortunate in the armature winders that it has on its payroll. Most of them are old timers who know every in and out of their particular work. They learned to wind armatures when the armatures were actually wound with loose wire, instead of having coils already made ready to fit into place on the armature core. This knowledge of the actual winding is invaluable to these men and makes their services very desirable to the company.

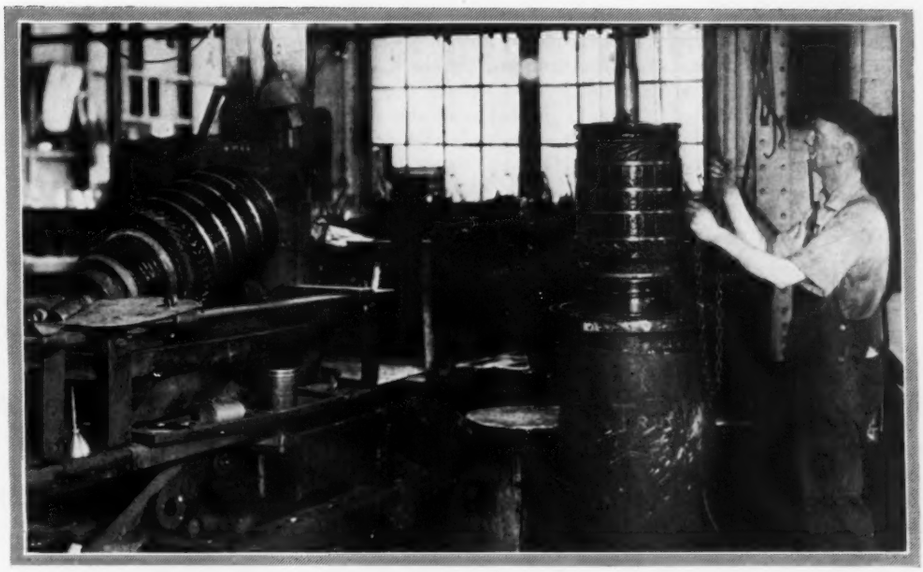
Mr. Benedict does not believe in making "jacks-of-all-trades" out of the men in the repair department. He thinks that every man should know his own job and know it thoroughly, and not worry about what the other employees are doing. Many repair shop heads believe that the personnel of a shop should be flexible so that it can be used to meet any overload that occurs in any part of the repair system. However, this same reasoning does not apply to the repair department of the Public Service Company because there is not much fluctuation to the amount of work that comes in. In this special case the men can be of most value to the company by spending every instant of their time on their own particular jobs. The more expert they become at this one thing, the more indispensable they are to the organization.

The Public Service Company of New Jersey has 8000 armatures to keep in running condition. This means that

COMMERCIAL motor repair shops can draw many lessons from the practices followed by the private shop of the Public Service Company of New Jersey, although the procedure suitable to one will not in every case be the best method for the other. One of the main points brought out in this article is the fact that the Public Service Company of New Jersey has a very small labor turnover in its repair department. When it once employed good workmen, it kept them satisfied and they stayed on their jobs. This is the whole secret of the efficiency of almost any organization. A great many repair shop owners are inclined to submit too easily to good workmen leaving their employ. Another point which should be stressed is the fact that a good set of records is indispensable to any motor repair shop. The Public Service Company of New Jersey can look up the past history of any armature that it has ever handled. Really intelligent work cannot be done without this information at hand. THE EDITOR

the repair department is kept continually busy. The armatures come in for repairs or rewinding on the average of 100 a month. This means that 1200 armatures are serviced every year. The company figures that a coil is good for seven years of operation before it needs rewinding, unless by accident it burns out. To make assurance doubly sure, the department always rewinds any armature which is in need of repairs and which has been running for five years or over.

Mr. Benedict explained that the foreman of the car barn tests trolley motors which have broken down in order to determine whether the trouble is in the armature or field coils. He has the damaged part removed and replaced with a spare one. Extra armatures and field coils are kept at all car barns. The part which has caused the trouble in the motor is sent to the motor repair department for overhauling. No attempt is ever made to repair any part of the motor at the car barn itself.



The armature at the right is being dipped in insulating varnish. The armature at the left has been dipped and is now being allowed to drip and to cool gradually

The motor repair department is on the second floor of the company's repair building at 703 Ferry Street, Newark, N. J. Armatures and coils are taken up to the second story shop by elevator. Each morning the head of the motor repair department inspects all motors that have been brought in. He has a complete set of records showing the past history of the particular armature or field coil that he is examining. This history includes such information as the make of the motor, when it was purchased, the number of times it has been repaired, and of what the repairs consisted. He decides whether a repair or rewinding job shall be done, and assigns the particular piece of work to the proper workman.

In case it is an armature that has to be rewound, it is immediately stripped. The core is then rewound with a coil that is taken out of stock. Mr. Benedict explained that the company does not do its own coil winding. Many different kinds of motors are bought, and coils are purchased from the same companies as the motors in which they are to be used. "When I came here ten years ago," said Mr. Benedict, "I found them making coils in a way I did not approve of, and I made them stop." He then showed how at that time the policy had been to wind wires around a form, after which procedure the wires were removed and all bent together to the proper shape to fit the armature. This causes the cotton insulation on certain of the wires to crack more than on others, and produces generally unsatisfactory results. When coils are made, the wires should be wound around forms that are already in the proper shape. The manufacturing companies with which the Public Service Company deals perform the operation in this manner. The company figures that it is cheaper to have this work done for it.

After the armature has been completely rewound, it is placed in an oven and baked. The object of this baking is to remove all moisture from the coils. The baking is always done at night by the repair department. The arma-

This is a general view of the motor repair shop of the Public Service Company of New Jersey. The men are working on the rewinding of armatures. To the right of the motor department is the machine shop where shafts and bearings are trued

ture is placed in the oven in the evening and taken out the following morning, having been baked for approximately fourteen hours. The armature is dipped in black insulating varnish while it is still hot. This causes the coil to soak in the varnish as it cools. In this way the coil becomes impregnated with it. Following this the armature is hot banded in order to force the coils down into place in their proper slots in the core.

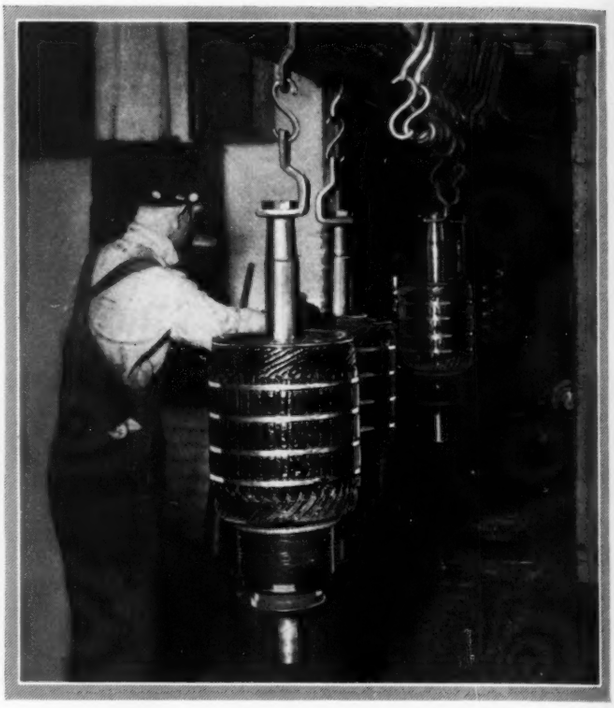
How Armatures Are Tested

ONCE again the armature is dipped. Now it is placed in the oven for another night of baking. In the morning it is allowed to cool off. Then the temporary band is ripped off the coil and a permanent banding wire fastened around it. This is followed by another dipping and baking to be sure that none of the insulation has been disturbed by the replacing of the band. The armature is now finished and is ready for testing, to see whether or not there are any open or short circuits in it. The armature coil is used as the secondary of a transformer, through the primary of which 1500 volts of alternating current are passed. If the coil does not break down at this voltage and smoke, it is considered all right as far as short circuits are concerned. It is tested with a millivoltmeter to determine whether or not there are any open circuits. In case the armature has been repaired instead of rewound only 1000 volts of A. C. are used in the transformer test.

Insulation Integrity Is Assured

WHEN a field coil is rewound, it is dipped and baked seven different times in order to assure the integrity of its insulation. Mr. Benedict said that past experience was the reason for the extreme care now taken with these coils. At one time, every car on the company's system was stopped because the field coils had failed when exposed to water. The causes for these failures were traced back and it was found that a manufacturing company was insulating its coils by wrapping them with twelve layers of oiled linen

These coils are being fitted into the grooves in the armature. Note that working supports on which armature rests are provided with rollers as a bearing surface for the shaft



Armatures suspended from an overhead trolley rail are being pushed into the electric oven for fourteen hours of baking. They are placed in at night and removed the next morning

which was submerged in an insulating bath just before it was wound on the coils. This was not sufficient insulation as the water could in some places seep between the adjacent loops of tape at the overlap. Once in the coil the water frequently was unable to get out again.

Coil Wound in Seven Layers

THE dipping of the oiled linen gave the repair department an idea. The workmen would dip the coil as it was being wound, and thus it would be made practically impervious to water or other agencies for breaking down insulation. The coil is now wound in seven layers, and, after the winding of each layer, it is both dipped and baked. After the completion of the process, the coil is put through a very rigid test. It is placed in a shell one-half filled with water and allowed to stand there for twenty-four hours. At the end of that time it is tested with 600 volts for grounds. If there is a drop of two volts or over, the coil is not passed, but has to be rewound. In recent years the company has not had to rewind any coils for this reason.

Cooling Coil "Breathes"

EVEN when an armature has only been repaired it is dipped and baked. This is done because the band has had to be cut away in order to make the repairs and the armature must now be hot banded. Mr. Benedict likened the action of a cooling coil to breathing. It veritably sucks in the insulating varnish with which it is coated. Thus, the cooling process is the best time for applying the insulation.

The work of the motor repair department of the Public Service Company of New Jersey must fit a very special set of conditions. To meet these, the repair shop has set up a series of very severe tests which the finished work must undergo before it is approved. In order to attain the necessary skill in labor to have the finished product meet these tests the company originally employed excellent workmen—men who either knew their jobs from beginning to end or who were intelligent and quickly picked up the necessary detailed knowledge. Having built up a smooth working and efficient organization, the company kept their workmen happy and on their jobs.

Nickel—Its Electrical Uses

No. 3 of a Series of Articles on Common Materials

The chief electrical use of nickel is in heat resistance units. In alloyed forms it possesses great strength, homogeneity and resistance to corrosion

By William Crawford Hirsch

NICKEL possesses valuable electrical properties, chief among which is its imperviousness to electric current. In addition to this, however, the beneficial transformation which nickel brings about when used as an alloy in ferrous and non-ferrous metals, together with its popularity as a surface coating, make it one of the most important of the electrical manufacturer's raw materials.

Nickel is a lustrous, silver-white metal, having a slight gray tinge. The Chinese gong makers were attracted by its bright color, its sonorous quality and resistance to corrosion long before Cronstedt, a Swedish metallurgist, isolated the element in 1751, the Chinese having come upon a nickel-copper ore which they called pakfong. They sensed this to be something out of the ordinary and wrought vessels and utensils from it that found a ready market in Europe in the 17th century.

The world's commercial supply of nickel is obtained chiefly from the Sudbury area of Ontario, Canada, where the ore occurs in the form of large veins of mixed pyrrhotite and chalcopyrite, carrying copper as well as nickel. Next in importance are the oxidized ores of New Caledonia which contain no copper. Canadian ores are the basis of more than 80 per cent of the world's nickel supply. New Caledonia furnishes approximately 10 per cent, the remaining 10 per cent production being divided between Norway, which, before the Canadian and New Caledonia deposits were opened up, supplied nearly the entire world's needs; Sweden; and Germany. The Ural Mountains of Russia and South Africa are known to contain nickel deposits. Only future years can determine their commercial importance; for the present, they are of interest only to the geologist and mineralogist. A number of years ago an American producer near Fredericktown, Mo., reported a small nickel output from ores that also yielded a slight quantity of cobalt, but since 1921 no domestic production has been reported.

Refining Processes

IN the Canadian mining and smelting of nickel-ores, hydroelectric power plays an important role, power plants, hoisting and sorting arrangements being thoroughly modern and efficient. Crushing and sorting of the ores is followed by head-roasting or sintering. The ore is smelted in water-jacketed furnaces. The resulting furnace matte, containing 15 to 25 per cent of copper-nickel, is changed into Bessemer matte by treatment in basic converters, the resulting product running 80 per cent in copper-nickel and the remainder in sulphur and iron. This matte is shipped to the refineries.

Before the War, the bulk of Canadian nickel matte was refined in the United States. Today nickel refining is largely a Canadian industry, financed by American capital. Secondary processes, such as rolling, are carried out in the United States. Some Canadian nickel matte finds its way to Wales for refining. Of the four nickel refining processes, the principal one is the so-called Orford process in which refining is effected by means of furnace and wet operations, the nickel either being made in the form of shot or being poured into ingot molds. This method was developed by the late Ambrose Monell. The Welsh process, in the discovery of which Dr. Ludwig Mond had the leading share, is based on chemical action, the nickel emerging from the decomposing chamber in the form of pellets. Because the New Caledonia ores contain no copper, their smelting and refining is more simple. They contain a high percentage of sulphur, and are roasted in coal-fired reverberatory calciners, charcoal being used for the final reduction to metal. Cubes and rondelles are the shapes into which Caledonian ores are normally refined. As in other non-ferrous metals, electrolytic refining is coming

Copper-nickel matte is here piled on the floor of a refinery. The refining process consists of separating the nickel from the copper and other impurities by heat treatment

more and more to the front in the nickel industry. The so-called Hybinette method, in which the separation of copper and nickel is ingeniously carried out, the metallic nickel being deposited in sheet form on iron cathodes, is chiefly in vogue. It permits the resulting metal being marketed as 99.9 per cent pure.

A relatively small tonnage of nickel is contributed to the American supply from the refining of other metals. Such by-product nickel comes chiefly from the electrolytic refining of blister copper, a ton of which yields on an average one pound of nickel, recovery from the refining bath being crystallized in salt form.

Nickel is most generally used in alloy form. Perhaps the best known of the non-ferrous alloys is nickel-silver, formerly called German silver. This constitutes a class of nickel-copper-zinc alloys. Cupro-nickel, nickel-bronze, nickel-brass are alloys with a lesser nickel content. Monel metal is a natural alloy of nickel and copper obtained by the reduction of the ore as it occurs in the Canadian deposits.

This reduction in size of telephone loading coils is made possible by replacing powdered iron cores with permalloy cores. The same reduction is possible with other coils requiring metal cores

Nickel's outstanding physical virtue is its ability to impart strength to other metals and to promote their homogeneity as well as resistance to corrosion. Nickel's reputation as a "war metal" is based on its wide use in armor plate for battleships, in which resistance to impact was, of course, one of the chief considerations. Today, however, nickel is one of the most important of peace metals. Without it there would be neither skyscraper nor automobile nor electrical heating devices. Nickel's malleability and ductility permit it to be rolled into extremely thin sheets and drawn into the finest wire. Its coloring power, either when added as an alloy to other non-ferrous metals or when superimposed on them by electrodeposition in the form of a thin film, beautifies the appearance of countless commodities and appliances. Chemically it is passive to caustic alkalies and a strong resistant to atmospheric oxidation. Weak acids affect it slightly. Two properties give to nickel a unique place in electrical manufacturing. The first of these is its high resistance. The second is the striking transformation produced by nickel in the thermal and magnetic characteristics of other metals when it is alloyed with them.

This is a 26 in. cold rolling mill through which is being fed a sheet of pure nickel. The sheets pass through a series of these rolling mills in the breaking down process. The one shown here is the last mill

Perhaps the largest tonnage of nickel used in making any single electrical instrument is consumed in the production of heat-resisting elements. The well known nickel-chromium alloys, sold under trade names and based on the A. L. Marsh patents, together with copper-nickel and nickel-steel alloys not embraced in the Marsh patents, account for a considerable part of the nickel consumption. In fact, it may be said of the electric heating industry that the conversion of electric energy into heat energy grew up with the nickel industry. Thus electrical stoves, ranges, heaters, cooking utensils, laundry irons, percolators, industrial tools, etc., form one of the largest outlets for nickel.

A good deal of nickel is used in thermo-couples in thermo-electric pyrometers. The electromotive force of some of the nickel alloys used in this connection is higher at temperatures below 1,000 degrees C. than that of platinum, having the additional decided advantage of an extremely small coefficient of expansion.

High nickel steels—steels with a nickel content of from 24 per cent upward—show remarkable properties from an electrical point of view. An alloy that contains 46 per cent nickel and is known as "platinite" has the same expansion as platinum and is used instead of that precious metal for sealing into glass the lead-in wires of electric lamp bulbs. A 38 per cent nickel-steel core wire, encased in copper, is another form in which nickel is used for the same purpose. Ferro-nickel—as nickel-steel containing 25 per cent of nickel is frequently called—is used in the manufacture of rheostats. A nickel alloy, frequently mentioned, is Invar. It contains about 36 per cent nickel, and, having practically no coefficient of expansion, is used chiefly in fine measuring instruments, being frequently aged for that purpose. In this process it is stored under special conditions for several years, so as to stabilize change of volume with change of temperature.

Permalloy, consisting of 80 per cent nickel and 20 per cent iron, has dethroned pure iron from its leadership as the material of highest magnetic action. Magnetization is a most important consideration in the transmission of sound waves, and, following extensive research by the Bell Telephone Laboratories last year, it was reported that permalloy would displace pure iron in sound-transmitting devices, being possessed of the most sensitive magnetic properties.

This machine shop is a marvel of neatness. It is as pleasant to work in as is the average office. This elimination of dirt aids production not only directly but also indirectly, for the employees are more willing to work in such an atmosphere. The entire Hubbell factory is operated on the basis of careful consideration for working conditions and the welfare of the company's employees

This Manufacturer, by Careful Handling of Employees, is

REVIVING *Handicraft Skill*

Harvey Hubbell, Inc., fosters in its personnel an esprit de corps which results in quality workmanship

By F. A. WESTBROOK

THE skill of the handicraft age coupled with the speed and efficiency of modern times is the standard of workmanship set and achieved by Harvey Hubbell, Inc., Bridgeport, Conn., manufacturer of light sockets, switches and electrical specialties. The company's success in obtaining high quality work is attributed to its attitude toward its employees, who are given every consideration both as to personal treatment and working conditions. Efficiency has been obtained in the plant by cutting red tape to a minimum and by installing the most modern machinery wherever possible in order to speed up production.

Mr. Hubbell feels that an organization can be expanded to a point where efficiency and quality both automatically begin to fall off. The loss of efficiency will be due to the company's becoming cumbersome. The falling off of quality will result from the owner's getting out of touch with his employees, who will lose the interest they formerly showed in their work and eventually become discontented. It follows from this that the length of service of employees will fall off, and hence the personnel as a whole will be less skillful.

In accordance with his beliefs on this subject, Mr. Hubbell has kept his employee total at about one thousand. Most of the personnel has been with the Hubbell company for a long period of time. Nearly all of the department heads have been with the company for from twenty to twenty-seven years. The factory foremen average from fifteen to twenty years of service, while it is not unusual to find other employees who have eight or ten year records. This condition makes for individual skill and organization teamwork which it would be impossible to obtain except through years of working with a fixed personnel.

Among the employees there is a very definite esprit de corps. Mr. Hubbell takes every opportunity to encourage this spirit. He has sponsored a brass band which is made up mostly of workmen from his own plant. Other Bridgeport manufacturers supply the rest of the talent. But this is distinctly a Hubbell enterprise. The company has a room which is reserved for band practice. A professional band leader has been hired by the company on a full time basis merely to train the musicians. This band has made for itself a statewide reputation, and always plays at the Danbury Fair in October.

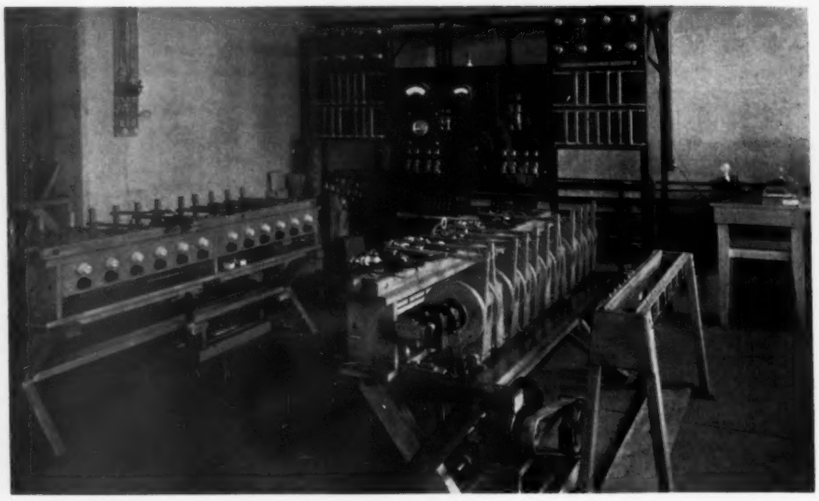
Welfare Work for Employees

HAVING a band made up of the company's workmen has a wonderful effect on the rest of the organization. It gives them a pride in their company that makes them want to do good work. In the same way, their liking for the company is increased by the fact that Mr. Hubbell has established a medical department with a nurse always present to care for anyone who is ill or has been hurt. This makes the employees feel that they are being cared for, that the company really thinks they are human beings and not machines. This personal interest in the employees is reflected many times in the quality of work that they turn out.

A man who works with the Hubbell company is assured that he will receive absolutely fair treatment from his employers. In order to bring about this condition, Mr. Hubbell has made it a rule that no one shall be dismissed from the company unless the superintendent of the plant passes on the case. That means that the employee may state his case to a man who is not interested in taking sides, but is thinking only of the ultimate good of the plant. If the employee desires, he may see Mr. Hubbell himself about his trouble. This system gives the employees a feeling of safety in their positions. They know that as long as they do their jobs well and act reasonably they will be as-

sured of their living. With this happy frame of mind they work more efficiently than could men who are constantly worrying.

The factory was built in the shape of a U, and all rooms are well lighted with windows on two sides. There is also an up-to-date artificial lighting system. The rooms are excellently ventilated and are kept spotlessly clean. The good lighting and cleanliness are extremely important because of the small size of the parts handled by the workers. Poor light and the presence of dirt always tend to slow down the speed of production in such a plant. The employees appreciate being able to work in pleasant surroundings. This is one of the factors that enter into the building up of their company spirit.



These are benches used for testing switches and sockets. Individual motors run the cam shafts on the benches. The cams operate lever arms which open and close the switches or sockets. The switchboard controls the load on them

Every work day the employees are expected to stop work fifteen minutes or half an hour ahead of time in order to clean their machines or working benches. Once every week the motors are inspected and serviced. These precautions insure the smooth working of the machinery. Mr. Hubbell, however, does not require that elaborate records be kept of the inspections made, as is done in many plants. He believes that he must fight detail, or, from the very nature of the work, it will swamp the whole organization with clerks. He overcomes the necessity for this by having competent employees who can be trusted to do their work well, regardless of whether or not records are kept.

Every mechanical method possible is used by the company to cut down production costs. A reduction in any specific instance may not be great, but carried out in every practicable case it results in substantial savings because of the great number of processes used in the factory. An example of scientific saving is shown in the use of motors in the tapping department. There are a large number of individual drive motors here and a great many of the motor driven machines are frequently idle. This is because Mr. Hubbell has figured that it is more economical to have enough machines to keep certain ones set permanently for regularly recurring work and to let them stand idle the rest of the time than to reset them frequently.

The assembly benches are ingeniously arranged for the quantity production of small objects. They consist of rather long benches with workers on each side and a conveyor belt along the middle. In some places, small conveyors have been installed to feed into the large conveyor to prevent the workers having to reach very far. Each employee performs a single operation or set of operations on the piece of equipment that is being made. Then the apparatus is placed on the conveyor and carried along to the next worker who performs the next operation on it. Each employee inspects his work manually before sending it on. And, at the end of each bench, the article is tested both electrically and manually.

The engineering department of the company frequently makes operation tests on the finished products. These tests are usually for the purpose of finding out how many times a switch, socket or other piece of apparatus can be used under service conditions without failing. Other tests are made under greatly exaggerated conditions. An example of this is the testing of switches designed for 110 volt service on 250 volts. Raw materials that are used in the plant are also tested for tensile strength, malleability, ductility and other qualities.

There is a planning department which routes the orders through the factory. Intensive study by this department has resulted recently in large savings by the better routing of work. Records are kept by this department which enable it to know exactly where in the plant the order of a certain customer is at any time. This tends to produce good customer relations, as immediate reports can be rendered to clients as to the exact status of an order. Such methods mean much to the company in the way of maintaining good will.

These girls on high stools are working in the assembly line. Individual motors are above certain of the positions to power the tools used in particular operations. The room has many windows and a semi-indirect electric lighting system

The company generates its own direct current. The chief engineer in charge of the power plant has been with the company the full 33 years that it has been in existence. Only once in that period of time has there been a power shutdown during working hours. The boilers are provided with mechanical stokers. The master clock for the whole plant is located in the boiler room and is operated by a storage battery charged from the power switchboard. The latter is equipped with modern automatic circuit breakers, which are free from fuses.

World Exposition Is Planned by Barcelona for 1929

American manufacturers are invited by Spain to display their products at the international exhibition at Barcelona from April to December 1929

THE Exposition of Barcelona, an international exhibition of art, industry and athletics, will be held at Barcelona, Spain, in 1929, from April 1 to December 31. The Palace of Electricity and Power will be one of the main exhibition buildings, and will have display booths of electrical manufacturing companies from all parts of the world.

H. M. the King of Spain is sponsoring the Exposition, although it is under the immediate supervision of the city of Barcelona. The president of the Exposition is the Marquis de Foronda, one of the most successful industrialists in Europe.

The primary purpose of the Exposition is educational. Spain is the fourth wealthiest nation in Europe and the business interests of Barcelona decided that it was time to let the world know something of the industrial importance and the economic strength of their nation.

This is the architect's project of the Palace of Light, where exhibitions of the electric light manufacturers will be placed on display

All of the important cities of Spain have been fully electrified, and now the benefits of electricity are being rapidly extended to the villages and rural districts. This makes that country an excellent market for the products of American manufacturers. Already a number of electrical companies in the United States are doing a large business with both Spain and the surrounding countries.

The imports of Spain used to consist mainly of raw materials. She is still a large purchaser of raw products, such as cotton, but in recent years an ever increasing proportion of her imports has been manufactured goods. Spanish imports from the United States annually total approximately seventy million dollars, of which over half consists of electrical, civil engineering, mining, agricultural and industrial machinery and supplies.

The Barcelona Exposition has been planned practically ever since the end of the World War in 1918. Its preparation has been both thorough and elaborate, and everything has been done to assure its success from the standpoint of the exhibitor. Marcelo Ventura, Steinway Hall, 113 West 57th Street, New York City, is the delegate who will arrange for the exhibits of the American manufacturers. The American Chamber of Commerce in Spain, located at Barcelona, has made known its willingness to assist American participants.

It is appropriate that this exposition should be held in Barcelona, for it is the urban center of the Province of Catalonia, where the greatest industrial activity of Spain is concentrated. Barcelona, besides being Spain's leading seaport, is the principal port of the Mediterranean. It is one of the oldest commercial centers in the world. Its annual trade comprises 2,300,000 tons importation and 500,000 tons exportation.

One-third of the total of goods imported into Spain passes through the port of Barcelona, and this has resulted in the development of an excellent transportation system. It is the terminal of the leading railways of the country. It is served by several large steamship lines with regular sailings from the principal ports of Europe and America.

The Exposition will be in a park on the slopes of the mountain of Montjuich, bordering on the outskirts of the city of Barcelona. Five thousand laborers are now at work erecting eleven temporary pavilions and palaces to hold the exhibitions. There are already four permanent palaces in the park. All buildings will be constructed of steel, stone and concrete to make them fireproof.

The permanent buildings are as follows: The National Palace, the Palace of Building Arts, the Palace of Temporary Exhibitions, and the Press Building. The stadium where the athletic events are to be held will also be permanent. All the buildings will be grouped together around the amusement zone where different entertainments will be installed.

Prizes will be awarded for the best exhibit in each class as follows: grand prize, grand prize (parity), diploma of honor, gold medal, silver medal, bronze medal, honorable mention and diploma of collaboration. Exhibitors submitting products classified under separate headings may be awarded for each one of them. However, only one prize will be granted to any one exhibitor in any one class of products.

The exposition board makes the following statement in regard to foreign exhibitors: "Foreign exhibitors shall be afforded the same privileges as nationals. It will be assumed that in signing the blanks of application they wholly and unreservedly accept every regulation of the present by-laws and likewise accept any provisions contained in other sets of rules that may be decided upon by the board of directors and executive committee. Exhibitors agree also to submit to the jurisdiction of the Courts of Barcelona." The board of directors will arrange with foreign governments for the construction of special pavilions.

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

1928 Export Values

The United States exported electrical apparatus valued at $8,606,909 in April and $34,124,694 for the first four months of 1928, as compared to $8,845,709 in April, 1927, and $32,591,183 for the first four months of 1927. Some of the detailed export values for the first four months of 1928 were: generators and accessories, including steam turbine generator sets and self contained lighting outfits, $1,871,199; motors, starters and controllers, including portable electric tools, $4,879,381; batteries, all types, $3,096,403; transformers, all types, $920,384; meters, indicating, recording and testing instruments, $828,292; radio broadcasting and receiving sets and accessories, $2,987,533; copper wire, bare and insulated, $2,164,208; lamp bulbs, $1,787,505; electric fans, $309,195; domestic clothes washers, $521,718; refrigerating sets up to one ton capacity, $1,673,730.

Radio Sales

Gross radio equipment sales for 1927 reported by 7737 dealers amounted to $90,785,050. The sales by geographical divisions were: Middle Atlantic States, 1436 dealers, $23,642,743; East North Central States, 2270 dealers, $22,753,729; Pacific States, 748 dealers, $12,560,341; West North Central States, 1643 dealers, $10,675,182; New England States, 599 dealers, $7,391,854; South Atlantic States, 387 dealers, $6,176,727; West South Central States, 459 dealers, $4,144,379; Mountain States, 346 dealers, $2,369,911; East South Central States, 210 dealers, $1,071,184.

New Orders

New orders for electrical goods booked during the first quarter of 1928 amounted to $244,917,000, according to Department of Commerce reports from 86 manufacturers. Orders for the first quarter of 1927 amounted to $243,651,415, and for the last quarter, $239,999,000.

Motor Orders

New orders for motors in March amounted to $889,110 as compared to $767,634 in February, 1928, and $1,078,639 in March, 1927. Motor billings for March, 1928, amounted to $782,185 as compared to $627,799 for February, 1928, and $802,572 in March, 1927.

Shipments of Porcelain

Shipments of electrical porcelain for February and March were: Standard, $49,536 in March and $65,809 in February; special, $131,212 in March and $110,933 in February; high tension, $444,804 in March and $438,584 in February; 1,297,000 glazed nail knobs in March and 2,441,000 in February; 1,381,000 unglazed nail knobs in March and 1,070,000 in February; 1,087,000 tubes in March and 975,000 in February.

Household Electricity Costs

The 1928 price of household electricity is 15 per cent lower than in 1913, according to the National Electric Light Association. Figured on the purchasing value of the dollar in 1913, this reduction is equivalent to 50 per cent. If, over the same period, the rate had increased proportionately with the cost of living, instead of falling off, the present price would be 100 per cent greater than the 1913 rate.

Australian Battery Output

The Department of Commerce reports that the major portion of battery manufacturers in Australia use from 100 to 120 tons of lead per month, producing approximately 11,000 batteries a month.

1927 Greek Radio Imports

A total of 233 radio receiving sets, valued at approximately $53,000, were imported into Greece during 1927, according to the *Economist* of Athens. France was the most important market, 105 of the sets coming from that country. The United States was next, supplying 47 sets.

Ice Cream Cabinet Figures

Out of approximately 345,260 retail dealers in ice cream in the United States 105,000 have been supplied with electric ice cream cabinets, the *Western Confectioner* states. In addition there are about 20,000 automatically refrigerated soda fountains. Of the cabinets sold, 94 per cent went to ice cream manufacturers direct. Of these, about 60 per cent were loaned to the dealer, 25 per cent leased to him and 15 per cent sold on long term payments or a rebate basis by the manufacturer.

Increases in Manufacturing

The National Industrial Conference Board has compiled figures showing that from 1899 to 1925 the output of the manufacturing industries in the United States increased 178.35 per cent. Increases in different sections were: New England, 87.87 per cent; Middle Atlantic, 141.17; East North Central, 237.65; West North Central, 145.84; South Atlantic, 222.59; East South Central, 181.69; West South Central, 410.99; Mountain, 176.16; Pacific, 379.53; east of Mississippi, 167.96; west of Mississippi, 234.49.

Australian Market

Electrical goods business in Australia is very dull, but a slight seasonal change is expected shortly. The electrical trade is encouraged by contemplated government developments. A recent electrical and radio exposition at Sidney, New South Wales, gave the trade an impetus in that section.

Flexible Cord Shipments

In March 42,390,000 ft. of flexible cord were shipped to fill orders and 44,958,000 ft. were in stock at the end of the month. In February 37,279,000 ft. were shipped and 47,277,000 ft. were in stock.

Steel Ingot Record

For the first quarter of 1928, production of steel ingots reached a new high of 12,544,156 tons, as compared with 12,137,192 in the first quarter of 1927, and 12,440,607 in the first quarter of 1926, the previous high record. Operations during March averaged 90.72 per cent of capacity, and the same high rate was maintained for the first half of April.

National Credit Survey

The Department of Commerce in association with the National Retail Credit Association has undertaken a nation-wide retail credit survey, chiefly as to cash transactions, open credit, installment payments, monthly balance, collections, bad debts and detailed credit administration. According to J. R. Hewitt, first vice-president of the association, retail sales now approximate $40,000,000,000 a year, 60 per cent of which involves credit.

Middle West Conditions

For the eighth consecutive month, the volume of business in the Ninth Federal Reserve District has exceeded the volume in the corresponding month of the preceding year. Increase in debits has been most pronounced in those cities where the small grain crop had the most direct effect, such as Minneapolis and the cities in Montana, North Dakota and northern South Dakota. Country bank conditions are good.

Distribution Costs Rise

The distribution costs of 81 corporations in 28 industries increased 33 per cent in the first six months in 1927 as compared with the same period in 1926, according to Ernst & Ernst. Sales were 4 per cent less; profits 19 per cent less; material costs 4.1 per cent less; labor costs 1 per cent less; factory expense 1 per cent greater; administrative expense 5.5 per cent greater.

Auto-Starter Components

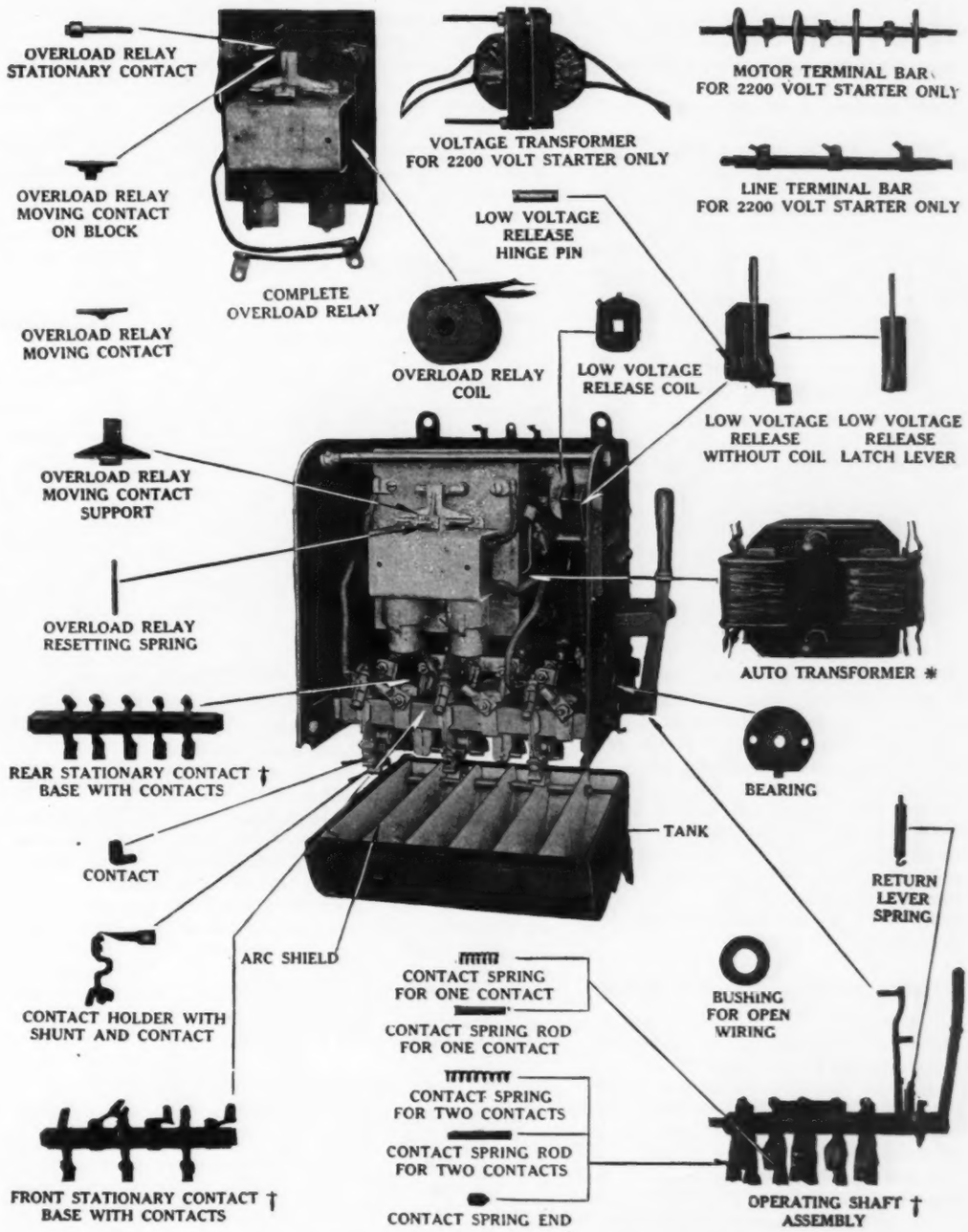
THE accompanying illustrations show the raw materials and parts which are utilized in the assembly of an autotransformer motor starter. These devices are widely used for starting induction motors on reduced voltage

THE case and oil tank for this auto-starter are stamped from a special grade of sheet steel. The transformer is wound on 0.017 laminated transformer steel

INSULATING barriers between the contacts are baked assembled in varnish that is impervious to moisture and oil. The panels are made from ebony asbestos

CONTACT supporting bars and shaft are cold rolled steel with a rust proof treatment upon which high grade micarta tubing is pressed

ALL exposed parts and hardware are made rust proof by sherardizing or cadmium plating. All circuit carrying parts are copper, with joints treated to eliminate oxidation. The shafts are ground and run in babbitt bearings


OVERLOAD RELAY STATIONARY CONTACT
OVERLOAD RELAY MOVING CONTACT ON BLOCK
OVERLOAD RELAY MOVING CONTACT
COMPLETE OVERLOAD RELAY
VOLTAGE TRANSFORMER FOR 2200 VOLT STARTER ONLY
MOTOR TERMINAL BAR FOR 2200 VOLT STARTER ONLY
LINE TERMINAL BAR FOR 2200 VOLT STARTER ONLY
LOW VOLTAGE RELEASE HINGE PIN
OVERLOAD RELAY COIL
LOW VOLTAGE RELEASE COIL
LOW VOLTAGE RELEASE WITHOUT COIL
LOW VOLTAGE RELEASE LATCH LEVER
OVERLOAD RELAY MOVING CONTACT SUPPORT
OVERLOAD RELAY RESETTING SPRING
AUTO TRANSFORMER *
REAR STATIONARY CONTACT † BASE WITH CONTACTS
BEARING
TANK
CONTACT
RETURN LEVER SPRING
ARC SHIELD
CONTACT SPRING FOR ONE CONTACT
BUSHING FOR OPEN WIRING
CONTACT HOLDER WITH SHUNT AND CONTACT
CONTACT SPRING ROD FOR ONE CONTACT
CONTACT SPRING FOR TWO CONTACTS
CONTACT SPRING ROD FOR TWO CONTACTS
FRONT STATIONARY CONTACT † BASE WITH CONTACTS
CONTACT SPRING END
OPERATING SHAFT † ASSEMBLY

ELECTRICAL MANUFACTURING *acknowledges the assistance of the Westinghouse Electric & Manufacturing Company for the use of these illustrations and in the preparation of the text*

ALL castings used in the auto-starter whose component parts are illustrated above are malleable. All terminals are welded to the cables. Both flat braided and round stranded shunts are used. These shunts are subjected to treatment by a special process which is designed to eliminate any tendency toward oxidation. This process coats the copper of every strand of the shunt, not only on the surface of the shunt, but also on its interior.

The contact supports are made from steel punchings. These steel punchings are rust proof and they are applicable for standard production. The material from which all the contacts are made is extruded copper.

EVERY contact is processed for the purpose of preventing copper oxide coating from forming. This process also protects the contacts from certain chemical reactions. All the component parts which are due to receive a great deal of wear are case-hardened.

The overload relay is used to prevent excessive heating of the motor windings. The low voltage release is designed to hold the operating shaft of the starter in the running position under normal operating conditions. The auto-transformer is designed to meet ordinary operating conditions with a considerable margin of safety The foregoing description of a typical auto-starter serves to illustrate the variety of materials used.

Accomplishments of Nema Sections

(Continued from page 120)

total kilowatts of the resistance type electric furnaces sold each year from 1920 to 1927 inclusive. A review has been undertaken of the business policies of the section, a committee on standardization has been appointed, and a joint committee has been appointed with the N. E. L. A. to study business development methods.

Electric Measuring Instrument Section

This section started as a small group on the standardization of instrument transformers. The membership was expanded to take in the electrical instrument manufacturers, and a good start has been made on the standardization of instruments and their performance.

Transformer Section

This section meets four times a year. It works with the Electrical Apparatus Committee of the N. E. L. A. and has been very active in manufacturing and performance standardization of transformers, standardization of specifications, specification sheets, data forms for use of buyers and outline drawing symbols.

Mining and Industrial Locomotive Section

Five or six meetings of this section are usually held every year, and its standards will be found in the Handbook of Nema Apparatus Standards, just off the press. A committee is now working on the development of standards for the motors used in locomotives that will be simpler than the standard ratings of railway motors. The section is also cooperating with the Bureau of Mines in the preparation of a schedule covering the testing and approval of inclosed reel and trolley locomotives.

Motor and Generator Section

The manufacturers of motors and generators were the first group of electrical manufacturers to organize when they formed the American Association of Electric Motor Manufacturers in 1908. That organization was ultimately expanded in 1910 into The Electric Power Club, which was one of the organizations which was merged into Nema. One of the first activities of this group was standardization, and its standard performance specifications have been the basis for the sale and purchase of motors and generators for over a decade. In addition to the development of manufacturing performance standards, the section has prepared and promulgated instructions for the proper installation, operation and care of electric motors and generators, and is now engaged in the development of trade standards for electric motors. The section is also collecting statistics.

Electric Welding Section

Standards for rating, performance, and test of direct current arc welding machines have been compiled by this section, which is also collecting sales statistics. Further standardization is in progress, as well as review of business policies, and planning for the development of the business. The section contributed to the support of a committee appointed by the American Research Council for the purpose of developing welding technique for steel building structures and to provide the essential data for the development of building codes for buildings using welded construction similar to the present codes for buildings using riveted construction.

Switchgear Section

This section is divided into three groups, covering oil circuit breakers, power switchboards, and power switching equipment. Manufacturing, rating, and performance standards of these products have been developed, as well as standard information forms covering the information required for the selection of oil circuit breakers. General specification forms have also been developed for these different products, as well as instructions for their proper installation, operation, and care by users. Statistics are being collected, business practices are being reviewed, and the possibility of increasing the market is being investigated.

Industrial Control Section

The Industrial Control Section meets twice a year. The first electrical standards to be adopted as an American Standard by the A. E. S. C. were the standards of this section. The members of the section are all keenly interested in cost accounting methods and other activities of the Association. Building equipment specifications, market development, fire and safety codes, and Underwriters' Laboratories Standards are all subjects which receive the constant and careful attention of the members of this section.

Radio Division

Receiver Section

This is a very active section which has been reviewing recommendations for standards, and rural devices, parts, antenna devices, and receivers. It has adopted many of the recommendations which have become industry standards.

Transmitter Section

Until very recently, the possible work of this section has been limited because of the rapid developments which have taken place in transmitter construction. Recently this committee has become very active, and it is believed that much progress will be made which will be of material assistance both to the work of the Federal Radio Commission and to the industry as a whole.

Power Supply Section

This section was formerly known as the Battery and Socket Power Section, but with the advent of the A. C. tube the name was changed. The recent development of socket power radio sets replacing all batteries has thrown a great deal of work upon this section and each of the committees of which it is composed. Standardization of socket power apparatus has been difficult in the face of new developments, but, in spite of this, much progress has been made by the section in establishing standards.

Vacuum Tube Section

The standardization work of this section has met with considerable enthusiasm on the part of vacuum tube manufacturers. The section cooperates very closely with both the Receiver and Transmitter sections.

Appliance Division

Electric Range and Water Heating Section

This section used to be included in the Heating Appliance Section, but in January, 1927, was organized as a separate section. The section is working on a range standard and has also supported the work of the committee on heater cord tests. It has an active Sales Promotion Committee, which is working in cooperation with other associations and educational institutions in a proposed plan of training retail salesmen and home economists. It works in cooperation with the Underwriters' Laboratories. It has also appointed a Trade Practice Committee.

Heating Appliance Section

This section has been organized for over ten years, during which time it has accomplished much along the lines of standardization. It has collected statistics and is cooperating with the Underwriters' Laboratories on standard specifications for heating appliances. It has actively supported the Joint Committee on Heater Cord Standards and Tests. Its Traffic Committee has done excellent work in seeing that proper rates were maintained on the products of the members of the section.

Fan Motor Section

This section has always been one of the most active in the Association. It has compiled very comprehensive statistical reports for many years, covering both export and domestic sales. Through its Technical Committee it has kept in close touch with the Bureau of Standards, Federal Specifications Board, on Navy specifications covering various types of fans, the committee meeting from time to time with the Electrical Supplies Committee, Federal Specifications Board for full discussion of these specifications. The section holds two regular meetings, one in spring and one in fall. The first meeting is usually held in New York City and the other one at a place more convenient to the western members. One of its important committees is its Merchandising Council, which has made a careful study of present merchandising methods. It has done much to promote adoption of the best methods and practices.

New Goods—for Your Inspection

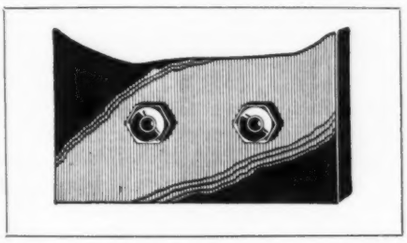
A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

Attachment Plug

Cutler-Hammer Mfg. Co., Milwaukee, Wis., has brought out the C-H Dreadnaught attachment plug. It is built entirely of metal except for a bakelite strip and fibre lining. It is designed with a rugged riveted construction to prevent the blades from turning. The plugs are finished in brown or steel gray.

Insulated Tip Jack

Yaxley Mfg. Co., 9 S. Clinton St., Chicago, are marketing insulated tip jacks, designed for use in radio sets. They are constructed to take any standard phone



tip plug so that the plug will fit all the way into the jack. They have insulated caps made of bakelite, and are finished in two colors—red for the positive line and black for the negative.

Air Column Speakers

Operadio Mfg. Co., St. Charles, Ill., has added three manufacturers' type radio speakers to its line. Model No. 30, illustrated, has a 30 in. air column and measures 7 in. high, 8 in. wide and 7 in. deep. It weighs 6 lbs. Model No. 54-A has a

54 in. air column and measures 12¼ in. high, 14½ in. wide, 7 in. deep. It weighs 10 lbs., including bracket feet for mounting. Model 84-A has an 84 in. air column and measures 16 in. high, 20 in. wide and 12 in. deep. It weighs 24 lbs., including bracket feet. All these speakers are built of light weight composition cast en bloc, designed to prevent absorption and side wall vibration. They are constructed to operate with or without power tube and on A.C. or D.C. sets. Models 84-A and 54-A are provided with lugs for lag screws or bolts.

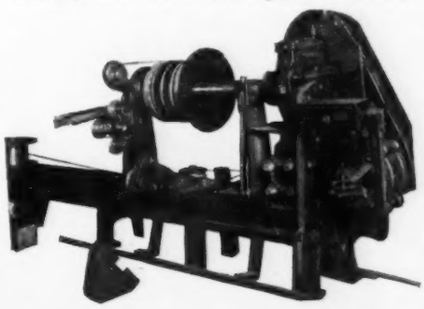
Triumph Fixture Fitting

Triumph Mfg. Co., 310-13th St., West New York, has placed on the market the Triumph fixture fitting for portable lamps.

This device consists of two pull-chain sockets, a brass support, and a head-piece as illustrated. It is furnished completely wired and ready for use.

Banding Wire Tension Indicator

General Electric Co., Schenectady, N. Y., has brought out a binding wire tension indicator for use in the repair of railway



and general haulage motors. This device indicates the tension in pounds applied to the steel binding wire by the machine or lathe. It also provides a simple means of keeping track of this tension throughout the full operation of binding the armature. With this device the wire will not be stressed beyond the elastic limit or tensile strength of the steel. It can be used on practically any type of armature binding machine. The rotary dial can be set to read from any angle. The indicator dial is accurately calibrated from zero to 500 lbs. The center pulley over which the wire runs, is actuated by a heavy spring so that if the machine is stopped during the binding process, a constant tension is maintained and the wires will not loosen.

Manual Starter

Cutler - Hammer Mfg. Co., Milwaukee, Wis., is marketing manual safety starter C-H 9115. It is equipped with double break, roller type contacts, the rollers and fingers of which are exceptionally large. They are made of heavy copper and are cadmium plated. All wiring is on the front of the panel. Current carrying parts are heavily insulated. The starter can be installed without removing the panel for wiring. The case cannot be opened unless the handle is in the "off" position. Inverse time limit overload protection is obtained through the use of thermal overload cutouts. The motor is protected both while running and while starting. The case is so made that it can be attached direct to the machine. The starter is interchangeable up to 7½ hp.

Switchboard Wire

Rockbestos Products Corp., New Haven, Conn., is marketing an asbestos and varnished cambric switchboard wire insulated with a smooth outer cotton braid that is furnished in either black or gray. The wire is designed to withstand severe conditions of heat, moisture, acid fumes, oil, flame and gas.

Split-Phase Motor

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, is marketing split-phase induction motor, type RB, made in ⅛, ⅙ and ¼ hp. sizes. It is equipped with an instantaneous break switch of sturdy con-

struction, which was especially designed to meet the needs of the motor. It has spacious well-insulated terminals and the rotor is dynamically balanced. The motor frame is made of rolled steel. The base is a steel plate, welded to the frame.

Canopy Receptacle

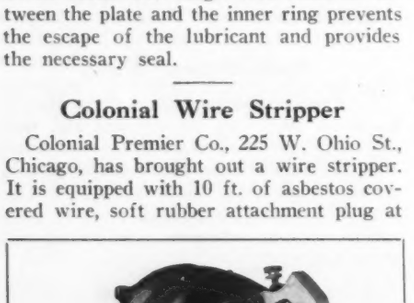
Bryant Electric Co., Bridgeport, Conn., is marketing Model No. 724, a receptacle for mounting in canopies. This device has a Templus composition body, a lug to prevent rotation and a finding rib. The receptacle face is concave and has a rounded composition rib between the slots, designed to allow instant insertion of the prongs in the cap. The device is held in position by a screw ring on the body behind the canopy. It is rated at 10 amps., 250 volts.

Ball Bearing

Strom Bearings Co., 4527 Palmer St., Chicago, has brought out an enclosure plate type of ball bearing to be used for supporting armature shafts where it is difficult to obtain the proper inner seal to prevent the escape of the lubricant from the bearing housing into the motor. The outer race ring is grooved and into it is pressed the edge of the plate which extends into an undercut in the inner race ring. The close fit between the plate and the inner ring prevents the escape of the lubricant and provides the necessary seal.

Colonial Wire Stripper

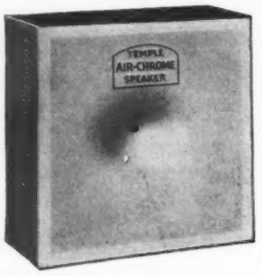
Colonial Premier Co., 225 W. Ohio St., Chicago, has brought out a wire stripper. It is equipped with 10 ft. of asbestos covered wire, soft rubber attachment plug at



one end and detachable motor plug at the machine end. The bench model weighs 35 lbs. The rotating knives that cut all around the wire and twist the conductor if stranded are operated by centrifugal force instead of by springs. It will strip all kinds of wire up to ½ in. in diameter. The motor is a General Electric, ball bearing motor, ¼ hp., of rugged construction. The steel knives are replacable. All moving parts are enclosed.

Temple Air-Chrome Speaker

Temple, Inc., 1919 S. Western Ave., Chicago, has brought out the Temple Air-Chrome, open radiator type loud speaker, with diaphragm so arranged that the larger front half is tuned to lower frequencies and smaller back half to higher frequencies. It is equipped with a specially developed Temple, double-action unit with cap designed to allow free transmission of higher frequencies as well as protection against injury. Model J is 24 by 9 by 24



in. high, weighing 16 lbs. Model K is 14 by 7 by 14 in. high, weighing 8½ lbs., and Model F is 18 by 8½ by 23 in. high, weighing 8½ lbs.

Electric Turntable

Bodine Electric Co., 2256 West Ohio St., Chicago, is marketing an electric turntable, Model No. RC 10, which is designed for use in radio phonograph combinations. It is equipped with a single phase induction

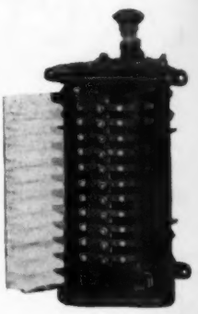
motor which has no commutator or brushes. This eliminates the interference in the loud speaker which usually results from sparking.

Cabinet Speaker

Utah Radio Products Co., 1615 Michigan Avenue, Chicago, has brought out Model XH combination cone and exponential horn loud speaker for use in con-

sole cabinet sets. The front opening dimensions are 14½ in. in height and 21½ in. in width. Its air column is 41 in. long. Its shipping weight is 14 lbs.

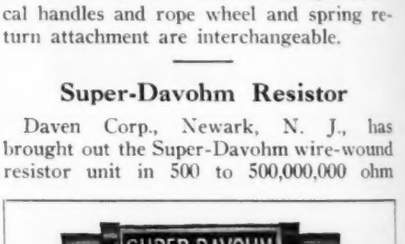
Drum Switches



General Electric Co., Schenectady, N. Y., has placed on the market three drum switches for use with squirrel-cage and slip-ring motors. They are designed especially for the control of small hoists, cranes, machine tools, etc., but can be used other places where a small drum switch is needed for such motors. The Type CR-3200-1250-A is a primary resistance drum switch for squirrel-cage motors providing four points forward and reverse. It is suitable for motors which do not have an overhauling load, such as hoists where automatic mechanical load brakes or worm gearing are used. Type CR-3200-1250-B provides four points forward and one reverse. It is suitable for use on machines with an overhauling load, such as hoists without worm gears or automatic load brakes. Type CR-3202-1308-A is a primary and secondary reversing switch for slip-ring motors providing five points forward and five points reverse. It is suitable for starting and regulating duty on 220, 440 and 550 volt motors of 15 hp. or less. All three switches have the same frames, but the cylinder developments are identical. Horizontal and vertical handles and rope wheel and spring return attachment are interchangeable.

Super-Davohm Resistor

Daven Corp., Newark, N. J., has brought out the Super-Davohm wire-wound resistor unit in 500 to 500,000,000 ohm



sizes, with a tolerance of accuracy of 1 per cent plus or minus. It is designed to have negligible distributed capacity and inductance. The units are 2 in. long and ⅝ in. in diameter. They are especially recommended for laboratory standard resistors, radio plate and grid resistors, high voltage regulators, multipliers for indicating instruments and isolation resistances in vacuum tube circuits.

Grade P Phenolite

National Vulcanized Fibre Co., Wilmington, Del., has placed on the market Grade P Phenolite, a laminated bakelite product which is designed to punch properly and be free from the obstacle prevalent with other grades of fibre of cold flowing. This grade of fibre is designed to have a high dielectric strength. It also has low water absorption. It is hard enough to resist cold flow and yet is flexible enough for fine punching. Grade P Phenolite is designed by its manufacturer for punching up to and including 3/32 in. in thickness.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of **ELECTRICAL MANUFACTURING** is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of **ELECTRICAL RECORD** as heretofore. This Classified Index has been an exclusive **ELECTRICAL RECORD** feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
ANNETERS. See Instruments.
ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature.
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.
ARMORING MACHINES. See Wire Manufacturing Machines.
ARMS, FLEXIBLE. See Tubing Flexible Metallic.
ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easex. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville, Inc., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Deceleco, Inc., Wayne, Mich.
Federal Insulating Corp., Yonkers, N. Y.
Johns-Manville, Inc., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zelite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).
BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.
BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.
BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery Wood.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Pulper Pottery Co., Flemington, N. J.

Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Pittsburgh Valve & Fittings Co., Barberton, Ohio. (Cast Iron.)
Rosale Mfg. Co., 200 Hudson, New York, N. Y.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.
BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Braun Bearings Co., Primos, Pa.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Marlin-Rockwell Corp., Jamestown, N. Y.
Hoffman. See Norma-Hoffman Bearings Corp.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, 141 Frelinghuysen Ave., Newark, N. J.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Mechanical Devices Co., Aurora, Ill.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Nevercoil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. P. B. See Mechanical Devices Co.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
P. O. B. See Mechanical Devices Co.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
More-Jones Brass & Metal Co., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.
BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.
BLUESTONE. See Chemicals, Battery.

BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago.
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Dept. 36, 111 W. Washington Chicago, Ill.
Garr Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 309 Decatur, Sandusky, Ohio. (Wrappers.)
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.
BRAIDING MACHINES. See Wire Manufacturing Machines.
BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Copper Smelting & Rolling Co., Baltimore, Md.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo.												H
B. B. B. See Becker Bros. Elec'l Corp.												
Baylis Co., Bloomfield, N. J.												H
Becker Bros. Elec'l. Corp., 25 N. Jefferson, Chicago, Ill.								C	W	S	H	L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.								C				
Boston Woven Wire Brush Co., Northboro, Mass.									W			
Boxill-Bruel Carbon Co., Columbus Park, O.								C			H	
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.								C				
Carbon Engrg. Co., Slinger, Wis.								C				I
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O.								C				
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y.								C				
Carenco. See Carbon Engineering Co.												
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y.								C	W	S		L
Columbia Machine Wks., & M. I. Co., 263 Chestnut, Brooklyn, N. Y.											H	
Cooley Mfg. Co., 98 Park Place, New York									W			
Diamond C. See Chapin Co., Chas. E.												
Dixon Crucible Co., Joseph, Jersey City												
Electra. See Automotive Mfg. Co.												
Electric Accessories Co., 310 York Ave., Philadelphia, Pa.											H	
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa.												
Eureka Copper Products Corp., North East, Pa.									W	S	H	
Fleck Carbon Co., 508 Broome, New York								C				
Flower, D. R., 1217 Spring Garden, Philadelphia, Pa.											H	
General Electric Co., Schenectady, N. Y.								C			H	L
Graphalloy. See Graphite Metallizing Corp.												
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y.								C			H	
Henrite Products Co., 98 Park Place, New York, N. Y.								C				
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio											H	
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.)								C				

BRUSHES, Commutator—Continued
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C . . . . . .
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C . . . . . .
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y. C . . . . . .
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C . . . . . .
Marganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C . . . . . .
National Carbon Co., Cleveland, O. ..... C . . . . . .
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spar. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. .... . W . . . . .
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C . . . . . .
Pure Carbon Co., Wellsville, N. Y. ..... C W S . . L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... . W L
Salem Electrical Supply Co., Salem, Mass. . W . . . . .
Seabury, Ralph L., Factories Bldg., Toledo, O. C . . . . . .
Snarr & Co. Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C . . . . . .
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C . . . . . .
Stackpole Carbon Co., St. Mary's, Pa. .... C . . . . . .
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C . . . . . .
U. S. Graphite Co., Saginaw, Mich. ..... C . . . . . .
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill. ..... C . . . . . .
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
BUGGIES. Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.
BUNCHING MACHINES. See Wire Manufacturing Machines.
BUSHINGS, SHAFT. See Bearings and Bushings.
CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.
CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2530 24th, Detroit, Mich.
Isert Co., J. H., 1334 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeels, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Resloh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 258 40th, Brooklyn, N. Y.
States Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 144 Bleecker, Newark.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Brannin Cabinet Co., 162 Chambers, New York, N. Y.
Carolina Wood Products Co., Asheville, N. C.
Carron Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.

Clinton Corp., 342 Madison Ave., New York, N. Y.
Crescent Chair Co., Plymouth, Wis.
Delker Co., Geo., Henderson, Ky.
Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Ebco Radio Cabinet Corp., 410 W. 27th, New York, N. Y.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillied Lumber Co. Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
United Cabinet Mfrs. Corp., 1615 S. Michigan Blvd., Chicago, Ill.
West Box Co., 235 Liberty, Springfield, Mass.
CABLE ARMORING MACHINES. See Wire Manufacturing Machines.
CABLE TEST SETS. See Instruments, Portable and Switchboard.
CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., Wilmington, Del.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.
CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
CARTONS. See Boxes and Wrappers.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.
CASTINGS, Aluminum. See Castings, Aluminum. Also
Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit.
Faries Mfg. Co., Decatur, Ill.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.
Sterling Art Metal Wks., 61 Grand, New York, N. Y.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

CASTINGS, Die

Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Olive Bldg., Pittsburgh
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Die Casting Co., 4509 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
McKinnon Chain Co., Tonawanda, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serrwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltak. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

Taft-Pierce Mfg. Co., Woonsocket, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros Co., Piano, Ill.
CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH UNTREATED

Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill. (Cotton Duck)

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Easton, Pa.

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) ..... See B
Silk ..... See S

Acme Wire Co., New Haven, Conn..... C S P . . .
Armatite. See Mica Insulator Co.
Brand & Co., Wm., 268 Fourth Ave., New York ..... P . . .
Campbellite. See Campbell Fibre Co.
Campbell Fibre Co., Stanton, Delaware..... B
Carboloid Products Corp., 15 Park Row, New York, N. Y..... C . . P . . .
Case Brothers, Inc., Highland Park, Conn.. . . . . B
Case & Risley Press Paper Co., Oneco, Conn. . . . . .
C-F. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa..... P F B
Chicago Mica Co., Valparaiso, Ind..... C . . . . . .
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Diamond State Fibre Co., Bridgeport, Pa.. . . . P . . .
Dielectric Mfg. Co., St. Louis, Mo..... C S P . . B
Federal Insulating Corp., Yonkers, N. Y... C . . P F . .
General Electric Co., Schenectady, N. Y.... C . . P . . .
Hewitt & Bros., C. B., 16 Ferry, New York C . . P . . .
Hi-Tex. See Stevens Paper Mills.
Incella. See Tarentum Paper Mills Co.
Irvington Varnish & Insulator Co., Irvington, N. J. ..... C S P . . .
Manning Paper Co., J. A., Troy, N. Y.... . . . . B
Mica Insulating Co., 200 Varick, New York C S P . . B
National Vulcanized Fibre Co., Wilmington, Del. ..... F . .
New Jersey Wood Finishing Co., Woodbridge, N. J. ..... C . . . . . .
Ohmold. See Wilmington Fibre Specialty Co.
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass. . . . . F . .
Rogers Paper Mfg. Co., South Manchester, Conn. ..... B
Schweitzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Scutan Co., 342 Madison Ave., New York . . . . P . . . .
Sico. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y. . . . . F . .
Standard Insulation Co., Rutherford, N. J. C S P . . .
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varnished Hard Fibreboard)..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn..... B
Tarentum Paper Mills Co., Tarentum, Pa.. . . . P . . .
Turbenite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. . . . P . . .
West Virginia Pulp & Paper Co., 200 5th Ave., New York..... B
Wilmington Fibre Specialty Co., Wilmington, Del. ..... P . . .

CLUTCHES, Magnetic

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished

Armature, Field, Electromagnet and Inductien Coils.
Acme Products Co., 22 Elkins (South Boston), Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Coilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 2101 Federal, Camden, N. J.
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 94 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 8 Centre, Newark, N. J.

Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Serison Magneto Engrg. Co., 538 Fernwood Ave., Toledo, O.
Stung & Barron, 210 E. Pratt, Baltimore, Md.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR

Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS

Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor

Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 2698 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 293 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 247 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd. Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Slauson Ave., Los Angeles
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 24 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Ea-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitrecell. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Frazee. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 319 W. Ohio, Chicago, Ill.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Mfg. Co., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschburg, Stutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

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DIALS

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Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Baumbach Mfg. Co., 1814 S. Kilbourn Ave., Chicago, Ill.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Westry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., Newark, N. J.
Roselle Mfg. Co., 215 E. 9th Ave., Roselle, N. J.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 12th and Sycamore, Cincinnati, O.
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel.

EYELETS

Platt Bros. & Co., Waterbury, Conn.

FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT

Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

FERRULES

Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)

Container Corp. of America, 111 W. Washington, Dept. 9J, Chicago, Ill.
Mid-West Box Co., Dept. 6, 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.

FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Duresto. See Spaulding Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 423 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
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Brandywine Fibre Products Co., North Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibre Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 2359 E. 67th, Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 14th and Willow Ave., Hoboken, N. J.
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1264 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B . . . .
American Pin Co., Waterbury, Conn. ..... I . . .
American Ring Co., Waterbury, Conn. (Candle.) ..... S . .
Ampinco. See American Pin Co.
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I . . .
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn. ..... S . .
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. ..... B . . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York. ..... B . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . .
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I . . .
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I . . H
Cambridge Brass Co., Cambridge, Mass. ..... B . . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B . . S . .
Crescent Brass Mfg. Co., Reading, Pa. ..... B . . . .
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ..... B I . . .
Dunlap Co., John, Carnegie, Pa. ..... S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B . . . .
E-Z Up. See Plume & Atwood Mfg. Co.
Farlen Mfg. Co., Decatur, Ill. ..... B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. ..... I . . .
Fralick Co., S. R., 15 S. Clinton, Chicago. ..... I . . .
Franklin Brass Foundry Co., Reading, Pa. ..... B . . . .
Friedley-Voshardt Co., Chicago. ..... B . . . .
Full-O-Lite Co., 723 S. Halstead, New York, N. Y. ..... B . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. ..... I . . .
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... S . .
Incandescent Supply Co., 468 West Broadway, New York, N. Y. ..... B . . . H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 228 Jelliff Ave., Newark, N. J. (Cross Bar.) ..... I . . .
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y. ..... I . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I . . .
Liberty Machine Co., Wauwatosa, Wis. ..... B I . . .
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. ..... H
L. & W. Brass Wks., 930 Orleans, Chicago, Ill. B . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. ..... I . . .
Macallen Co., Foundry St., Boston, Mass. ..... I . . .
Manhattan Brass & Elec. Co., 30 Warren, New York, N. Y. ..... B . . . .
Metal Products Co., 210 Canal, New York. ..... B . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. ..... I . . .

Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. ..... I . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. ..... B . . . .
Mitchell-Vance Co., 503 W. 24th, New York. ..... S . .
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I . . .
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) ..... I . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. ..... B . . . .
Noboit. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. ..... I . . .
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B . . S . .
Peerless Products Line, Mt. Washington, Baltimore, Md. ..... B . . . H
Perfeclite Co., 1457 E. 40th, Cleveland. ..... S . .
Pittsburgh Valve & Fittings Co., Barberton, O. ..... I . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. B I . . .
Rodale Mfg. Co., 200 Hudson, New York. ..... B . . . H
Sandow Tool Co., 1440 Broadway, New York ..... S . .
Schroeder Lamp Wks., Jersey City, N. J. ..... B . . . .
Scovill Mfg. Co., Waterbury, Conn. ..... B I . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors) ..... B . . . .
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. B . . . .
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B . . . .
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. ..... I . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S . .
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. ..... I . . .
Triumph Mfg. Co., 310-13, West New York, N. J. ..... S . .
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B . . . .
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B . . . .
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. ..... .
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. ..... B . . . .
Waterbury Mfg. Co., Waterbury, Conn. ..... B . . S . .
Waterbury Metal Wares Co., Waterbury, Conn. ..... S . .
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B . . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. ..... B . . S . .
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. ..... B . . . .
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 706 Russia, San Francisco, Cal.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jewel Elec. & Mfg. Co., 4505 Ravenswood Ave., Chicago, Ill.
Jimbetts. See Betts, Inc., James H.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Norden Co., 132 W. 43rd, New York, N. Y.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products, Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2622 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Skedoodle. See Phelps Elec. Co.

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Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Kalman Steel Co., 1844 W. Austin Ave., Chicago, Ill.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Kalman Steel Co., 1844 W. Austin Ave., Chicago, Ill.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.
FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... P . . . .
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn. ..... P N . . .
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. ..... P . . . .
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass. ..... C P N R O
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th St., Chicago, Ill. ..... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago ..... C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkins Pittsburgh ..... C . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va. ..... C P N R . .
Elliott Electric Co., Shreveport, La. ..... .
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y. ..... C . . N R . .
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. ..... C . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... C . . . R . .
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... P . . R . .
Hudson Wire Co., Ossining, N. Y. ..... O
Kantark. See Trico Fuse Mfg. Co.
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. ..... C . . . . .
Merrill Mfg. Co., 50 State, Boston, Mass. ..... .
Monarch Fuse Co., Jamestown, N. Y. ..... C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 753 Main, Buffalo, N. Y. ..... C P . . R . .
Platt Bros. & Co., Waterbury, Conn. ..... O
Powell, F. W., 119 W. Ohio, Pittsburgh. ..... P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass. ..... C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C . . . R . .
Royal Elec. Co., Chelsea Station, Boston. ..... P N . . .
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R . .
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING
Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.
GALVANOMETERS. See Instruments, Laboratory Standard.

GASKETS, Rubber
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.
GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS (Speed Changing Units)
Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.

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Gears—Continued
Heli-Spur. See Horsburgh & Scott.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Celoron Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co., Bridgeport, Pa.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 129 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Berylite. See Plaut & Co., L.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Fort Pitt-Jeannette Glass Co., Jeannette, Pa.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletlees. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kauffeld Glass & Ceramic Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Melilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opols. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearitone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestopal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.

Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Ename' Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
ICE CREAM CABINETS. See Refrigerator Cabinets.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickox Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Millvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pyroelectric Instrument Co., Easton, Pa.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Yawter. See Thompson-Levering Co.
Uniprint. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.

Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hickox Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago, Ill.
Jaynes, R. P., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn N. Y.
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thomspon-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Welford, Jr., Geo. W., 5415 Thomas Ave., Philadelphia, Pa.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS

Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS

Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy

Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Rodefer Glass Co., Bellaire, O.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Swanstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

JOINTS, Fixture Insulating

Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.
LACQUER, ARMATURE. See Paint, Varnish and Lacquer, Metal. See Paint, Varnish and Lacquer.

Classified

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LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES

(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.
LAVA. See Cores, Resistance Coil.
LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES

Sign Letter, Flashlight, Projector and Reflector.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Lights Co., 30 W. 15th, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign

Glass, Metal.
Addign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs Inc., 2736 Wentworth Ave., Chicago, Ill.
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature

Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket

Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.
LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKERS

Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Air-Chrome. See Temple, Inc.
Aristocrat Corp. of America, 125 W. 23rd, New York, N. Y.
Associated Radio Corp., Ann Arbor, Mich.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Borkman Radio Corp., 230 E. Ohio, Chicago, Ill.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Double Duty. See Aristocrat Corp. of America.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Enseo. See Engineers Service Co.
Fenco Cone Co., 55½ Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.

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G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Lata Isalsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products, 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radioceive. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Pressed Steel & Mfg. Co., Newton, Mass.
O'Neil Mfg. Co., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Puropower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Raliotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swcboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New ....k, N. Y.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Vitalitone Radio Corp., 203 6th Ave., New York, N. Y.
Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper

Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
French Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY
Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... .. P
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn..... .. P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S ..
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... .. P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... .. S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... .. P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C .. P
Reynolds Spring Co., Jackson, Mich..... .. S ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... .. P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

MACHINE SCREWS. See Screws, Machine.
MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.

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Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent

Bullens Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New York.

MANGANESE, Battery. See Chemicals, Battery.
MEASURING INSTRUMENTS. See Instruments.
MEGOHMMETERS. See Instruments, Laboratory Standard.
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
METAL CUTTING OUTFITS. See Welding and Cutting Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines.
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 154 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals Co., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 804 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.
MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION

Aico. See American Insulator Corp.
Alden Mfg. Co., Brockton, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., Graybar Bldg., New York.
Amerine. See American Insulator Corp.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Coil.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.

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PUNCTURE TEST .025" PLATE

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
27,416 Volts	22,171 Volts	23,212 Volts
Volts per mil of thickness computed from average breakdown voltage.		
1,097 Volts	1,109 Volts	1,161 Volts

No surface leakage during puncture tests was noted.

FLASH-OVER TEST (DRY)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,690 Volts	19,120 Volts	18,610 Volts

FLASH-OVER TEST (After Standing in Humid Air 24 Hours)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,970 Volts	18,440 Volts	18,460 Volts

SECOND READING (Electrodes in Same Position as in First Reading)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,770 Volts	18,560 Volts	18,290 Volts

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Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimco. See Dayton Insulating Moulding Co.
Durex. See General Plastics, Inc.
Durite. See Stokes & Smith Co.
Electrose. See Insulation Mfg. Co.
Erinold Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 56 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hercules Powder Co., Wilmington, Delaware.
Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 504 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Belleville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Keystone Specialty Co., 2373½ Coventry Rd. (Lakewood), Cleveland, O.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamix. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. Y.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Renite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Elec. & Mfg. Co., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.

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Name Plates
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Starite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOLYBDENUM
Elkon Wks. (subsidiary of P. R. Mallory Co.), Portchester, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL
International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches, Snap (Heavy Duty).

MOTORS
Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Ace. See A. C. Dayton Co.					
A. C. Dayton Co., 308 E. 1st, Dayton, O.			F	S	..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland	M	..	..	..	..
Actodector. See Roth Bros. & Co.					
Advance Elec. Co., 4311 Maple Ave., St. Louis	M	F	S	..	
Allis-Chalmers Mfg. Co., Milwaukee, Wis.	M	..	S	..	
Allis Co., Louis, Milwaukee, Wis.	M	..	S	..	
American Brown Boveri Elec. Corp., Graybar Bldg., New York, N. Y.	M	..	S	..	
American Elec. Motor Co., Cedarburg, Wis.	M	..	..	..	
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland	..	F	S	U	
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa.	M	..	..	..	
A. R. S. See Westinghouse Elec.					
Baldor Elec. Co., 4352 Duncan Ave., St. Louis	M	F	S	..	
B-Line. See Brown-Breckmeyer Co.					
Bodine Elec. Co., 2254 Ohio, Chicago	..	F	S	U	
Bogue Elec. Co., Chas. J., 132 King, New York	M	..	..	..	
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O.	M	F	..	..	
Burke Elec. Co., Erie, Pa.	M	F	S	U	
B. T. See Allis Co., Louis.					
B & R Mfg. Co., 812 Lafayette, Toledo, O.	..	F	..	..	
Cab. See Westinghouse Elec. Mfg. Co.					
Century Elec. Co., 1806 Pine, St. Louis, Mo.	M	F	S	..	
Chandeysson Elec. Co., St. Louis, Mo.	M	..	S	..	
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky.	M	..	..	..	
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O.	M	..	S	..	
Cleveland Elec. Motor Co., 5213 Windsor Ave., Cleveland, O.	M	F	S	..	
Colonial Fan & Motor Co., Warren, O.	M	F	S	U	
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.					
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J.	M	..	S	U	
Cushman Elec. Co., Concord, N. H.	M	F	S	..	
Day-Fan Electric Co., Dept. A, Dayton, O.	..	F	S	..	
Diehl Mfg. Co., Elizabeth, N. J.	M	F	S	..	
Diverter Pole. See Rochester Elec. Product Co.					
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O.	..	..	S	U	
Dumore. See Wisconsin Elec. Co.					
Eclipse. See Fidelity Elec. Co.					
Electric Machinery Co., Minneapolis, Minn.	M	..	S	..	
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.	..	..	..	..	
Electric Specialty Co., 221 South Stamford, Conn.	M	F	S	U	
Electro-Dynamic Co., Bayonne, N. J.	M	..	S	..	
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo.	M	F	S	U	
Engberg's Elec. & Mech. Works, St. Joseph, Mich.	M	..	S	..	
Esco. See Electric Specialty Co.					
Fairbanks-Morse & Co., Chicago, Ill.	M	F	..	..	
Fidelity Elec. Co., Lancaster, Pa.	M	F	S	U	
Fitzgerald Mfg. Co., Torrington, Conn.	..	F	..	..	
Fynn Welchsel. See Wagner Elec. Corp.					
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo.	F	..	S	..	
General Elec. Co., Schenectady, N. Y.	M	F	S	U	
Gilbert Co., A. C., New Haven, Conn.	..	F	..	U	
Hamilton Beach Mfg. Co., Racine, Wis.	..	F	S	U	
Hobart Bros. Co., Troy, O.	M	..	S	..	
Holtzer-Cabot Elec. Co., 125 Amory, Boston	M	F	S	..	
Howell Elec. Motors Co., Howell, Mich.	M	..	S	..	
Ideal Elec. & Mfg. Co., Mansfield, O.	M	..	S	..	
Imperial Electric Co., Akron, O.	M	..	S	..	
Janette Mfg. Co., 556 W. Monroe, Chicago	..	F	S	..	
Jantz & Leist Elec. Co., Cincinnati, O.	M	F	..	..	
Jeannin Electric Co., Toledo, O.	M	F	S	..	
Kan-Dor Elec. Co., 1821 E. 59th, Los Angeles	M	..	..	..	
Kendrick & Davis Co., Lebanon, N. H.	..	F	S	..	
Kimble Elec. Co., 634 N. Western Ave., Chicago	M	..	S	U	
King Elec. Co., 35 Murray, New York	M	..	..	..	
Knapp Elec. Corp., Portchester, N. Y.	..	F	S	U	
Leland Elec. Co., Dayton, O.	..	F	S	..	
L. E. See Leland Elec. Co.					
Lincoln Elec. Co., Cleveland, Ohio.	M	..	S	..	
Linc-Weld. See Lincoln Elec. Co.					
Linzee Elec. Motor Co., Mansfield, O.	M	..	..	..	
Mando Co., Syracuse, N. Y.	..	F	..	..	
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis.	..	F	..	..	
Marble-Card Elec. Co., Gladstone, Mich.	M	..	..	..	
Master Electric Co., Linden and Master Aves., Dayton, O.	M	F	S	..	
MC. See General Electric Co.					
Metergram. See Bodine Elec. Co.					
Michigan Elec. & Mfg. Co., Lake Linden, Mich.	..	F	S	..	
N. C. See Electric Controller & Mfg. Co.					
Norfolk. See Walter Elec. Mfg. Co.					
Northwestern Elec. Co., 408 S. Hoyne Ave., Chicago, Ill.	M	..	S	..	
Northwestern Mfg. Co., 480 Clinton, Milwaukee	M	..	..	..	
Ohio Elec. & Controller Co., 5904 Maurice Ave., Cleveland, Ohio	..	F	S	..	
O. K. See Marathon Elec. Mfg. Co.					
Osann Co., F., 245 Seventh Ave., New York	M	..	..	..	
Pan. See Chandeysson Elec. Co.					
Peerless Elec. Co., 740 W. Market St., Warren, O.	M	F	S	U	
Polar Cub. See Gilbert Co., A. C.					
Pow-R-Full. See Wagner Elec. Corp.					
Ra-Lite. See Acme Elec. & Mfg. Co.					
Reco. See Reynolds Electric Co.					
Red Band. See Howell Elec. Motors Co.					
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O.	M	..	S	..	
Reynolds Electric Co., 2622 W. Congress, Chicago	..	F	S	..	

IMPERVIOUS
INSULATING VARNISH
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IMPERVIOUS VARNISH CO.
421 Wood St., Pittsburgh, Pa.

Robbins & Myers Co., Springfield, O.	M	F	S	U	
Rochester Elec Products Corp., Rochester, N. Y.	M	..	S	..	
Rotator. See Bodine Elec. Co.					
Roth Bros. & Co., Chicago, Ill.	M	..	S	..	
Standard. See Robbins & Myers Co.					
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J.	M	..	S	..	
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal.	M	..	S	..	
Stow Mfg. Co., Binghamton, N. Y.	M	F	S	U	
Sturtevant Co., Boston, Mass.	M	F	S	U	
Sunlight Electrical Mfg. Co., Warren, O.	..	F	S	..	
Super Wick. See Master Elec. Co.					
Switch start. See Lincoln Elec. Co.					
Triumph Elec. Corp., Carthage, O.	M	..	S	..	
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa.	M	F	S	..	
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles	M	..	S	..	
Usemco. See U. S. Elec Mfg. Co.					
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Md.	M	..	S	..	
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo.	M	F	S	U	
Walter Elec. Mfg. Co., Norfolk, Va.	M	..	S	..	
Watson. See Allis Co., Louis.					
Welco Uniframe. See Wesche Elec. Co., B. A.					
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati	M	F	S	..	
Westinghouse Elec. Mfg. Co., East Pittsburgh	M	F	S	..	
Willey-Wray Elec. Co., Cincinnati, O.	M	..	S	..	
Wisconsin Elec. Co., 59 16th, Racine, Wis.	..	F	..	U	
Woods Mach. Co., S. A., Boston	M	F	S	..	
W-P Corp., Cairo, Ill.	..	F	S	..	
Zobell Elec. Motor Co., Garwood, N. J.	M	..	S	..	

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See also Decalcomania.
American Name Plate Co., 117 Imlay, Brooklyn, N. Y.
Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Celoron Co., Bridgeport, Pa.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Waterbury Button Co., Waterbury, Conn.

NICKEL
American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.
United States Nickel Co., New Brunswick, N. J.

NOTCHING MACHINES, Armature
Ferracute Machine Co., Bridgeton, N. J.
OHMMETERS. See Istruments, Laboratory Standard; also Instruments, Portable and Switchboard.
OIL-LESS BEARINGS. See Bearings, Oil-less.
OSCILLOSCOPES. See Instruments, Laboratory Standard.
OVENS, Industrial and Laboratory
Annealing, Temper Drawing, Mold Baking, Vulcanizing, Drying, Conditioning, Enameling, Japanning, Vacuum Impregnating.
Buffalo Fdry. & Machine Co., 1543 Fillmore, Buffalo, N. Y. (Armature and Coil.)
Despatch Oven Co., 120 First Ave., N., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas. See Thermo Elec. Instrument Co.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heldbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Mibo Co., 717 Sycamore, Cincinnati, O.
Oven Equipment Co., New Haven, Conn. (Coil Driers.)
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Simplex Elec. Heating Co., 85 Sidney, Cambridge, Mass.
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., H. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5834 Tabor Rd., Philadelphia, Pa.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thermo Elec. Instrument Co., 1206 Grove, Irvington, N. J.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6500 Mack, Detroit, Mich.
OXIDES, Battery. See Chemicals, Battery.
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Varnishes, Insulating ..... See V
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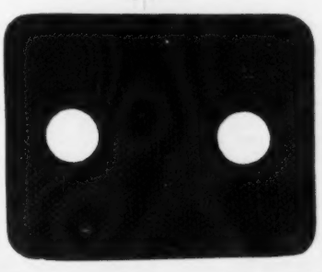

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Lacquer, Metal Finishing .....See L
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Acme Wire Co., New Haven, Conn..... V
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Lastite Co., 3166 Lincoln Ave., Chicago.. P L
Antakwa Co., 1329 Mohawk, Chicago, Ill..... P
Apexior. See Dampney Co. of America.
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. ... L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-O-Craft. See Southwestern Paint & Varnish Co.
Atom Chemical Co., 78 E. 10th, New York, N. Y.. ... L
Bakelite Corp., 247 Park Ave., New York, N. Y.. ... L
Belden Mfg. Co., 2310B, S. Western Ave., Chicago
Benolite Co., 501 Columbia Bank Bldg., Pittsburgh. V P
Berry Bros., Leib & Wight, Detroit, Mich..... V
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V
Bradley-Hurts Co., 2626 S. Dearborn, Chicago, Ill. ... L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P
Carboloid Products Corp., 15 Park Row, New York. V P
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V
Comulac. See Martindale Elec. Co.
Dampney Co. of America, Boston, Mass..... V
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. ... P
Eastman Kodak Co., Rochester, N. Y..... L
Eclipse Paint & Mfg. Co., Cleveland, O..... P
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York.. ... L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... L
Federal Insulating Corp., Yonkers, N. Y..... V P
Flex-ib-lac. See Dielectric Mfg. Co.
Franche & Co., 440 Orleans, Chicago, Ill..... L
General Elec. Co., Mda. Dept. Bridgeport, Conn.. V P
General Plastics, Inc., 56 Walck Rd., N. Tonawanda, N. Y. V
George Co., P. D., St. Louis, Mo..... V
G. E. See General Elec. Co.
Glidden Co., Cleveland, O..... V P L
H. B. See Maas & Waldstein Co.
Hercules Powder Co., Wilmington, Del..... V
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. & Co., 450 E. 3rd, Dayton, O..... V P
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y..... V P
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. V
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. ... L
O'Brien Varnish Co., South Bend, Ind..... V P L
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... P
Opex. See Sherwin-Williams Co.
Oxite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. ... L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Republic Varnish Co., 200 Thomas, Newark, N. J. V
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P
Rockbestine. See Rockbestos Products Corp.
Rockbestos Products Corp., New Haven, Conn.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. ..... .
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y..... V P
Sherwin-Williams Co., Cleveland, O..... V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo. ..... V P
Standard Flexible Comp. Co., 2607 Haverford Ave., Philadelphia, Pa. ..... V P
Standard Insulation Co., Rutherford, N. J..... V
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P
Standard Varnish Wks., 423 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa..... V
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. V
2095. See Mitchell-Rand Mfg. Co.
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P
Vulcan-Lastite. See American Lastite Co.
Walker Co., Henry V., 17 John St., New York..... L
Walpole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill..... L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P
Zapon Co., Stamford, Conn. L
Zeilac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. ... L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Meters. See Instruments, Portable & Switchboard.

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.

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Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.
PARAFFINE. See Wax and Compounds.

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Brown Paper Co., L. L., Adams, Mass.
Crocker-McElwain Co., Holyoke, Mass.
New York & Penn Co., 200 5th Ave., New York, N. Y.
Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Rogers Paper Mfg. Co., So. Manchester, Conn.
Taylor-Logan Co., Holyoke, Mass.
Union Paper & Twine Co., 116 St. Clair Ave., N. W., Cleveland, O.
Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn.

PEGS, Armature
Campbell Fibre Co., Heather Ave., Stanton, Del.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Federal Insulating Corp., Yonkers, N. Y. (Also Wedges.)
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
White Supply Co., 4347 Duncan, St. Louis, Mo.

PENS, Scorching
Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
Post Elec. Co., 7 E. 44th, New York, N. Y.
Stylectric. See Post Electric Co.

PERFORATING MACHINES
American Perforator Co., 617 W. Jackson, Chicago, Ill.
Asam Bros., 917 Arch, Philadelphia, Pa.
Asam Wright. See Asam Bros.
Capital Novelty Co., Lincoln, Neb.
Cummings Co., B. F., 4710 Ravenswood Park, Chicago, Ill.
Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

PHENOLIC INSULATION. See Fibre, Phenol. Also Molded Insulation.

PHOSPHOR BRONZE
(Ingot, Rod, Sheet, Wire)
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Elephant Brand. See Phosphor-Bronze Smelting Co.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Phosphor-Bronze Smelting Co., 2200 Washington Ave., Philadelphia, Pa.
Seovil Mfg. Co., Waterbury, Conn.

PHOTO-ELECTRIC TUBES
Burt, R. C., 327 S. Michigan Ave., Pasadena, Cal.
Photion Elec. Corp., 400 E. 139th St., New York, N. Y.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio.

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Biddle, James G., 1211 Arch, Philadelphia, Pa.
Foote, Pierson & Co., 160 Duane, New York, N. Y.
Gray Co., 64½ W. Johnson, Philadelphia, Pa.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Luxometer. See James G. Biddle.
Mathews. See Foote, Pierson & Co.
National Lamp Wks of G. E. Co., Cleveland, O.

PICK-UPS, TALKING MACHINE. See Loud Speakers.

PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners.

PINIONS. See Gears and Pinions.
PINION PULLERS. See Pullers, Armature Shaft.
PLATES, Name. See Name Plates; Also Decalcomanis.
PLATES (Plate)
Fixture Outlet. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.

PLATES, Storage Battery
Am-Plus Storage Battery Co., 425 W. Superior, Chicago.
Aro Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Champion. See Englert Mfg. Co.
Continental Battery Co., Papin and Compton, St. Louis, Mo.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., S. 25th and Jane Sts., Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Hemrick, Inc., 555 W. 52nd St., New York, N. Y.
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Chandeysson Elec. Co., St. Louis, Mo.
Connecticut Dynamo Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 522 Newell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave., Chicago Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Pan. See Chandeysson Elec. Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
Roth Bros. & Co., Chicago, Ill.
Westinghouse Elec. Mfg. Co., East Pittsburgh, Pa.

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Herpers Bros., 18 Crawford, Newark, N. J.
R. & H. Platinum Works, 709 Sixth Ave., New York.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment
A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1930 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Elec. Co., Hartford, Conn.
Arro-Grip. See Arrow Elec. Co.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
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Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products.
Circle F Mfg. Co., Trenton, N. J.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn.
Consolidated Gas Iron Co., 32 Union Square, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., Dept. ER4, 50 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
Felso Products Co., 124 S. Calvert, Baltimore, Md.
Fitzall. See Rodale Mfg. Co.
Gaynor Elec. Co., Inc., Stratford Ave., Bridgeport, Conn.
General Elec. Co., Bridgeport, Conn.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Imperial. See Consolidated Gas Iron Co.
Iona Co., Los Angeles, Cal.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Jiffy. See Esler Elec. Mfg. Co.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripplet. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 252 Lafayette, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
U. S. Electric Co., 311 Chambers, Trenton, N. J.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.

POCKET METERS. See Instruments, Pocket.

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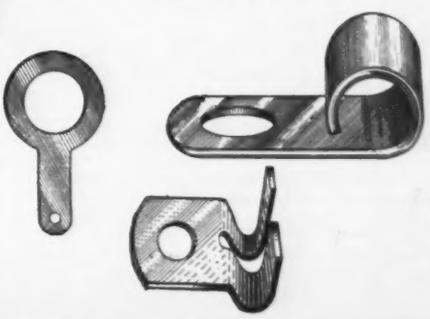

POINTS, Contact
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Independent Contact Point Co., 545 39th, Union City, N. J.
Interstate Products Corp., 23 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 39 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes
Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Parker, J. H., 296 Broadway, New York, N. Y.
Pass & Seymour, Inc., Solvay Sts., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co., Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Summit Porcelain Co., Summit, N. J.
Thomas & Sons Co., R., East Liverpool, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS
Unglazed earthenware cups for primary (wet) batteries.
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation
Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B., York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

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Its unusually high resistance to oxidation makes Hardy Metal especially adaptable for heavy service, where arcing burns the life out of ordinary points.
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CONTACT points, of all things, must be absolutely reliable—so much depends upon their proper functioning. Long experience and extra care in manufacturing have made Baker Contact Points the safe, reliable units they are. They may be had of Platinum, Iridio-Platinum, Silver and special alloys. We shall be glad to send you detailed descriptions.
BAKER & CO., INC.
54 Austin St. Newark, N. J.

PRESSES, Porcelain Molding
Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching
Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y.
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 354 West 13th St., New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft
Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition
Rockwood Mfg. Co., Indianapolis, Ind.
Spruceolite Co., Bloomfield, N. J.

PUMPS, Oil Burner
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum
To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Bishop & Babcock Mfg. Co., 49th & Hamilton Sts., Cleveland.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel
(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1820 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS
This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., 23 Elkins (S. B.), Boston, Mass.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago, Ill.
All-Henry Coil Co., South Gate, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Amsco Products, Inc., 416 Broome, New York. (TRF Kit.)
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Balcon. See Pacent Electric Co.
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st, New York, N. Y.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Payntar Ave., Long Island City, N. Y.
Buffer. See Aerovox Wireless Corp.
Buffalo. See DeJur Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.

Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crofot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsior Radio Corp., 226 Grand, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See Amsco Products, Inc.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kit.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Ohm. See Carter Radio Co.
Hi-Pet. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Held-Tite. See Carter Radio Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co. 2¼ S. 20th, Philadelphia, Pa.
Isodon. See Auburn Button Works.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kilograd. See Pilot Elec. Mfg. Co.
Krobiack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireles Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Corp.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Megzil. See Cole Mfg. Corp.
Megostat. See Pacent Elec. Co.
Melco-Supreme. See Amsco Products, Inc.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrid. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill. (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See Amsco Products, Inc.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol. See Wireless Radio Corp.
Perry Wire Works, 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Plander. See DeJur Products Co.

PORCELAIN
Mercer Porcelain Co., Inc., Trenton, N. J.
SPECIAL SHAPES
Let Us Quote Prices

Service at Exhibitions

When your best foot is foremost

During the noon hour, at twelve-thirty to be exact, a manufacturer called one of our district offices. He reported that the motor on the conveyor which his company was exhibiting at a convention had "burned out". There were crowds in to see the exhibits and his position was far from comfortable.

In ten minutes the office sent a motor specialist over to the exhibit. The motor, which was not of a rating carried in the local stock, had not burned out, but the bearings were frozen as a result of the motor having been operated without oil. Our specialist disconnected the motor and took it to the G-E Service Shop in a taxi. New bearings and oil rings were installed, oil was put in the wells, and the motor was again operating the conveyor by 3 o'clock the same afternoon.

When you put yourself in the public eye and something goes wrong—that's the time that the minutes of waiting for service seem like hours. General Electric Service Shops are ready to help you whenever you need emergency service—day or night, working days or holidays.

You are never out of reach of G-E Service. Express will reach the nearest Service Shop in a day. If the job is too large to ship, experienced men will come to you. Our shops are located in the following cities:

Atlanta	Erie	Oakland
Buffalo	Fort Wayne	Philadelphia
Chicago	Kansas City	Pittsfield
Cincinnati	Los Angeles	St. Louis
Cleveland	Lynn	Salt Lake City
Dallas	Minneapolis	Schenectady
Detroit	New York	Seattle

GENERAL ELECTRIC

Radio Circuit Components—Continued
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., Waukegan, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohms. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Protectorald. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radio File. See Pacent Elec. Co.
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistogrid. See Pilot Elec. Mfg. Co.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 538 Fernwood Ave., Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersole. See DeForest Radio Co.
Sonatron Tube Co., Chicago, Ill. (Resistance Coupled Amplifier).
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Tandem. See Bremer-Tully Mfg. Co.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Thorola. See Reichman Co.
Tobe Deutschman Co., Cambridge, Mass.
Tone Control. See Sprague Specialties Co.
Toreld. See All American Mohawk Corp.
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Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tune Rite. See Radiall Co.
Turn-It Radio Sales, 71 Murray, New York, N. Y.
Tuway. See Carter Radio Corp.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultimax. See Pacent Elec. Co.
Ultra Varlo. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Vernl-Juster. See Brooklyn Metal Stamping Corp.
Waterbury Button Co. Waterbury, Conn.
Web. See Bathgate Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.

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American Radio Hardware Co., 135 Grand, New York.
Bonsa. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
Dejur Products Co., 191 Lafayette, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co., Frank W.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Saturn Mfg. & Sales Co., 43 Beekman, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

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Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Mechanical Laboratories, Inc., 285 N. Sixth, Brooklyn, N. Y.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
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Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
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Dejur Products Co., 191 Lafayette, New York, N. Y.
De Veau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
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Electrical Products Mfg. Co., Providence, R. I.
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Gem-Jac. See Frost, Herbert H.
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Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug.)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
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Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Radiall Co., 50 Franklin, New York, N. Y.
Royalty. See Electrad, Inc.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tubestat. See Muter Co.
Union Radio Corp., 124 Sussex Ave., Newark, N. J.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
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Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Corp., 158 Summit Ave., Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Gold Seal Electrical Co., 250 Park Ave., New York, N. Y.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Peerless Electric Co., 33 W. 60th, New York, N. Y.
Q R S Music Co., 306 S. Wabash Ave., Chicago, Ill.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Schickerling Products Corp., 401 Mulberry, Newark, N. J.
Sonatron Tube Co., 108 W. Lake, Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.
Van Horne Co., 206 Center, S. Franklin, Ohio.

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Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
American Wireless Corp., 33 W. 17th St., New York, N. Y.
Arcturus Radio Co., 255 Sherman Ave., Newark, N. J. (Adapters.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
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Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa (Adapters).
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., Elkhart, Ind. (Adapters).

Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Morse Co., Frank W., Boston, Mass.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Onawaupun St., White Plains, N. Y.

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Radium Dial Co., Forbes and Meyran Ave., Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 533 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Composition.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

KEY
Battery Charging ..... See B
Floor Boxes ..... See F
Welding ..... See W
Machine Tool ..... See W
Watertight, Marine, Mine ..... See M
Car Trailer Connection ..... See C
Extension ..... See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 13 Water, New York M
Arrow Elec. Co., Hartford, Conn. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. F
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Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
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Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
General Elec. Co., Bridgeport, Conn. B
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
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Loeffelholz & Co., Milwaukee, Wis. C
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Ohio Elec. & Controller Co., 5904 Maurice Ave., Cleveland, Ohio W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
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Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa. F E
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 1417 Sansom, Philadelphia F E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

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Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Cello, Inc., 19 W. Houston, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite. See Raleo Mfg. Co.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1223 N. 31st, Philadelphia.
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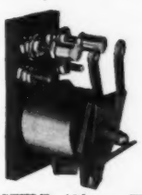

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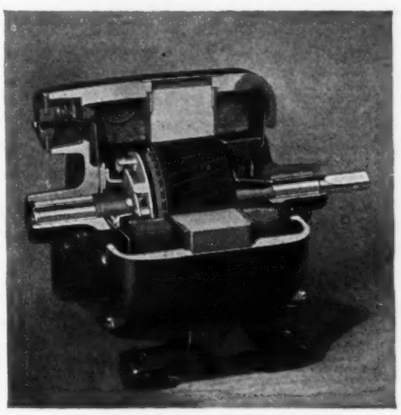

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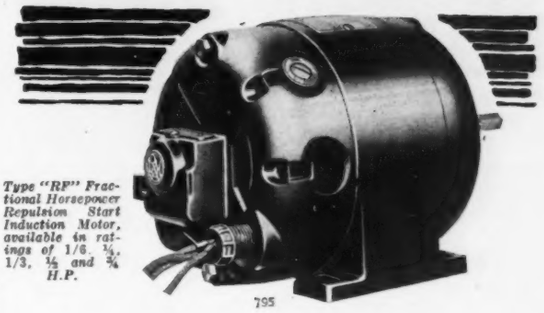

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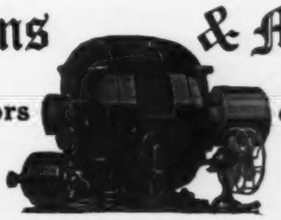

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REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

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Athermos. See Gurney Refrigerator Co.
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Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
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Cavalier. See Tennessee Furniture Co.
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Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Crystal Refrigerator Co., Fremont, Neb.
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Kleen Kold. See Harder Refrigerator Corp.
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Knox. See Erie Art Metal Co.
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Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 8901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

RELAYS

(See also Circuit Breakers and Thermostats.)
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Duneo. See Dunn, J. Struthers.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil
Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS.
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

	F	B	D	P	M	L
Allen-Bradley Co., 493 Clinton, Milwaukee						L
Biddle, James G., 1211 Arch, Philadelphia						L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O.						L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.)		B				
Bradleystat. See Allen-Bradley Co.						
Controlite. See Ward Leonard Elec. Co.						
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill.				P		
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F	B	D			L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa.	F					
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.	F					
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
General Electric Co., Schenectady, N. Y.	F					
Holzmuller, C. J., 1108 Howard, San Francisco, Cal.			D			
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.			D		M	
Knueller Elec. Co., De Pere, Wis.	F					
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago	F	B	D		M	L
Robertson, Leo F., 536 W. 22nd, New York, N. Y.					M	
Schaefer Bros. Co., 1059 W. 11th, Chicago		B				
Simplicity. See Cutler-Hammer Mfg. Co.						
Union Elec. Mfg. Co., Milwaukee, Wis.	F					
Universal. See Ward Leonard Elec. Co.						
Valley Electric Co., 4515 Shaw Ave., St. Louis, Mo.		B				
Vitrohm. See Ward Leonard Elec. Co.						
Ward Leonard Elec. Co., Mt. Vernon, N. Y.	F		D		M	
Watton. See Electric Products Co.						
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F				M	

RINGS Seal. See Packing.

RIVETS

Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco. See Vulcanized Rubber Co.

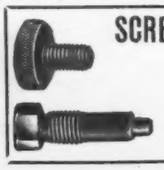
RUBBER, Sponge

Toycraft Rubber Co., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.

SCRAPERS, Wire

Acme. See A. Laubscher.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.



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Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SCREW SHELLS, Socket. See Shells, Screw Socket.

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Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Celoron Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis.
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Stelnen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlisle & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 555 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 306 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Aladdin Mfg. Co., Sales Dir. No. 802, Muncie, Ind.
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatchford Ave., Brooklyn.
Borghese. See Hall, Chas.
Cohan Co., Laigh M., 205 S. Ninth, Philadelphia, Pa. (Silk.)
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)

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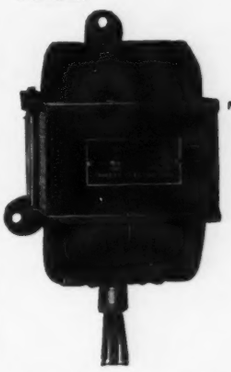

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Having no oil, they can be used inside of buildings and Meet all Code requirements.

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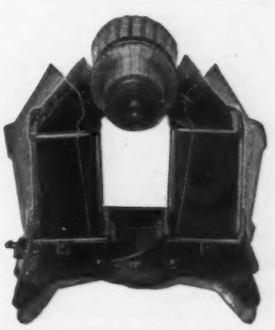
IDEAL adjustable portable Growler



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No. 2 has a	3½"	face and takes from	¾" to 12" diam.
No. 3 has a	5"	face and takes from	3" to 15" diam.
No. 4 has a	7"	face and takes from	6" to 20" diam.
No. 5 has a	10"	face and takes from	6" up

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The larger sizes are for Industrial Shops where all sizes and kinds from the fine wound, high voltage to the bar wound with only one turn are built or repaired.

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Electric Motor Control Apparatus

ALL TYPES OF D.C. MOTORS

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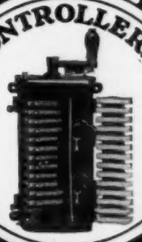

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Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kelton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Max-Ray. See Maxwell Ray Co.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Miller Co., Meriden, Conn. (Silk, Parchment.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1293 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 165 Vanderveer, Brooklyn, N. Y.
Bent Glass Novelty Co., 54 W. Third, New York, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Tiffany Studios, 391 Madison Ave., New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Piekhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 230 10th Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)
Waterbury Mfg. Co., Waterbury, Conn.

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.

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SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

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Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Munson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

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Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hulhorst Micro Tool Co., 3242 E. Monroe, Toledo, Ohio.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Quan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKETS, Flashing. See Flashers, Sign.

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Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS

Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Co., Hartford, Conn. ..... M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. ..... K . . P . . . .
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C . . . . P B . .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A

C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M . . K T P B A
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. ..... A W . . . . . .
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C . . . . . .
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Fluteller. See Pass & Seymour.
Frink Co., Inc., 230 10th Ave., New York, N. Y. ..... M C . . . . . B . .
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Bridgeport, Conn. ..... M C K T P B A
Glow Elec. Co., 22 Queens, Long Island City, N. Y. ..... M . . . . . B . .
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... M C K T P B A
Hubbell, Inc., Harvey, Bridgeport, Conn. ..... M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K . . P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Meteor Elec. Corp., 499 E. 70th, New York, N. Y. ..... K . . P . . .
Molded Socket Corp., Railroad, Pa. ..... K . . . . . .
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. ..... M . . . . . P B . .
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y. (Candle.) ..... T . . B . .
Rodale Mfg. Co., 200 Hudson, New York, N. Y. .....
Royal. See Sears, Henry D.
Safti See. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
TEC. See Electric Company.
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Walco. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P . . .
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usaroo. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Wilson Co., H. A., Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING
Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
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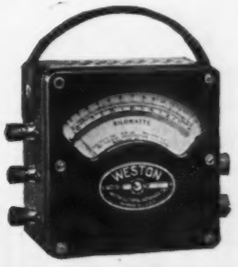

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Blue Seal Chemical Co., 126 Locust, Roselle, N. J.
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brunner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductable. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Letellier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmont Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammoniac.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Rodens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 330 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Sheco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co
Superior. See Highland Electro Chemical Co.
Technical Products Co., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tisit. See Letellier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 116 1st Ave. N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio See Drake Elec. Wks
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

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Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SPAGHETTI. See Tubing, Varnished Fabric.

SPEED CHANGING UNITS. See Gears (Speed Changing Units).

SPEED INDICATORS. See Tachometers.

SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYERS, Electric

Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Little Brown Jug, Inc., Reading, Pa.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago,
Presto. See Metal Specialties Mfg. Co.
Sprayit. See Electric Sprayit Co.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,

Advance Spring & Wire Co., 1749 Carroll Ave., Chicago,
American Spring & Mfg. Co., 212 Elm, Detroit, Mich.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Farrington & Co., 23 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 338 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Plano, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Corp., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1724 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago,
Riadon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

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Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Trumbull Steel Co., Warren, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife. See Switches, Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor;
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switcehs, Snap.

SWITCHES, Battery and Baby Knife

Cut-Outs. Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crocker Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.

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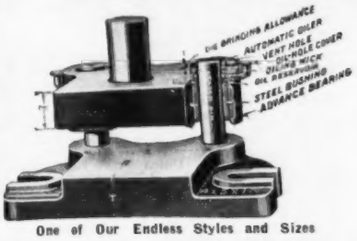

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Cross Sectional View

B·F·COFFIN MFG. CO.
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Switches, Battery & Baby Knife—Continued
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pulirite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spere Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Controller Co.
M. D. Co. See Mechanical Devices Co.
Mechanical Devices Co., Aurora, Ill.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 236 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 3907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 144 Bleeker, Newark, N. J.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY

Feed Through ..... See p
Fixture (Canopy, Candelabra and Key Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

See Also Switches, Snap; Heavy Duty.
Adam Electric Co., Frank, St. Louis, Mo. f
Anylite Elec. Co., Ft. Wayne, Ind. L
Arrow Electric Company, Hartford, Conn. f sp P R L F
Arrow Head. See Arrow Elec. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. f p P F
Best. See United States Elec. Mfg. Corp.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. f

Bridgeport Switch Co., 209 Center, Bridgeport, Conn. L F
Bryant Elec. Co., Bridgeport, Conn. f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. F
Circle F. Mfg. Co., Trenton, N. J. f P L F
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. p P R L F
Crouse-Hinds Co., Syracuse, N. Y. L
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. P L
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal. R
Diamond H. See Hart Mfg. Co.
Duplo. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. F
Gaynor Elec. Co., Bridgeport, Conn. f L
General Elec. Co., Bridgeport, Conn. f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. F
Hart Mfg. Co., Hartford, Conn. f sp P R L
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.) f sp P R L F
Hart. See Hart & Hegeman Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Harvey, Inc., Bridgeport, Conn. sp L F
Jost. See Morse, Frank W.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y. f P
Leviton Mfg. Co., 236 Newell, Brooklyn F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. f L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. s R
Morse Co., Frank W., 291 Congress, Boston, Mass. P
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill. L F
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. f sp P L F
Paulding, John I, New Redford, Mass. f s P
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y. L
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Roberts Elec. Mfg. Co., 2.2 Centre, New York, N. Y. F
Rodale Mfg. Co., 200 Hudson, New York p F
Sears, Henry D., 89 Boylston, Boston f sp P R L F
Sho-Lite, Inc., Dept. R, 141 Merrimac, Boston, Mass. (Pilot Light.) f
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. P
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. f s P R L
Trigle. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. f
Victor. See Keil & Son, Francis.
Weber. See Sears, Henry D.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y. F
Workrite. See Morse, Frank W.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank

Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Penn Elec. Switch Co., 306 Twelfth, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilboken Mfg. Co., 404 Grove, Milwaukee, Wis.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Cleveland. See D. J. Time Switch Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
D-J Time Switch Co., 1306 E. 14th, Cleveland, O.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.

Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Robbins & Myers Co., Springfield, O.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 203 Lafayette, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklen Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville, Inc., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Webbing Co., Nye, Pawtucket, R. I. (Cotton, Silk.)
Awebeco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beledentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.
Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Guscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Jas., Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okonite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville, Inc., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
New Yerk Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.

You are the Boss, yes—

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Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticks. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric
Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridion Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene.
Eagle Elec. Mfg. Co., Dept. ER4, 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. D., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 N. Capitol, Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O. San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil
(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., G Dept., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 70th St. & Woodlawn Ave., Cleveland, Ohio.
Electric Machine Corp., 529 N. Capital, Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmeo. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 272 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Forest Electric Co.
Portometer. See Forest Electric Co.

Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL
Briggs & Sons Co., J. Providence, R. I.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
King. See Electric Heat Control Co.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fruntenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sensatherm. See Mercoid Corp.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Taglianbue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermosnap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TIPS, Cord
Alden Mfg. Co., Brockton, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Saunton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing
Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery
Battery Equipment & Supply Co., 1638 S. Wabash Ave. Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Bosco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., 1823 Wyandotte, Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

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Bernz Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.

TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage
Sorgel Elec. Co., 89 W. Water, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition
For Oil Burners and Gas Tube Signs.
American Bosch Magneto Corp., Springfield, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elec'l. Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
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Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.

TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.

TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Straw Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Coit St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose & Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Metal Molding Co., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber
Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

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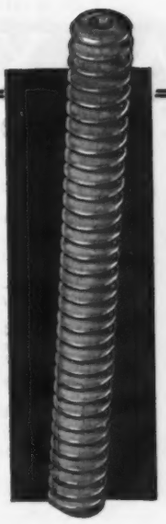
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TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston,
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1505 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 267 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2698 E 79th, Cleveland, O.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 23 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
Galvo Elec. Co., 1813 Columbus Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elect. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hexwound. See Monitor Controller Co.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Ironium Products Co., 112 Hamilton, Cleveland, O.
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repaireall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Simplex Electric Heating Co., 85 Sidney, Cambridge, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag. Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.

Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.

WASHERS, FIBRE. See Fibre.

WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock

Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadrigs Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.. .. S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S ..
Clifton Mfg. Co., 65 Brookside Ave., Boston.... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... W S ..
Dielectric Mfg. Co., St. Louis, Mo.... ..... W .. C
Dolph Co., John C., 168 Emmet, Newark, N. J. W .. ..
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn..... W .. ..
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O..... W S ..
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich..... W .. ..
Hexulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York..... W .. ..
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W .. ..
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W .. ..
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... W .. ..
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W .. ..
Sherwin-Williams Co., Cleveland, O..... W .. C
Standard Varnish Wks., 433 4th Av., New York.. W .. ..
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S ..
Star Porcelain Co., Trenton, N. J..... W .. C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W S ..
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. .... S ..
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y..... W .. ..

WELDS, Lamp Lead-in. See Filaments, Incandescent Lamp.

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternare. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Hy. Improvement Co., 2070 E. 61st, Cleveland, O
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fuzon Welding Corp., 103rd St. & Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 169 5th Ave., New York, N.Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.

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Manufacturers—Designers
[redacted]
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Riverside Ave,, Newark, N. J.
WILBUR B. DRIVER, PRESIDENT

Hanson. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Colt Rd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., Fort & Mt. Elliott, Detroit, Mich.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron, Chicago, Ill.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.

WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munadorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Ridlon Company, Frank, 253 A St., Boston, Mass.
Standard Radio & Elec. Co., Pawtucket, R. I.
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 136 Seventh, Jersey City, N. J.
Weehawken Elec. & Mfg. Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6162 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding .....See S
Copper Wire .....See C
Iron Wire .....See S
Phosphor Bronze .....See B
Radio Bus Wire .....See C
Resistance Wire .....See R
Steel Wire .....See S

Acme Wire Co., New Haven, Conn..... C ....
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa..... C R ..
American Brass Co., 25 Broadway, New York.
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R ..
American Electrical Works, Philipsdale, R. I.... C ....
American Fabric Co., 45 Baker, Providence, R. I. C ....
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C .. S
Anaconda. See American Brass Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C ....

From an article in Electrical World for December 31st, 1927.

showed its original structure. The indications were that the effect of continuous heat and vibration on insulation increases rapidly as time goes on. Continuous heating has no serious effect on mica insulation, even though the structural material becomes deteriorated. The results of these tests show that the life of mica-wrapped coils is approximately ten times that of coils using treated cloth wrappers. It is evident that failure of this insulation in service is not due to its dielectric strength being impaired, but rather to mechanical failure caused by some external disturbance.

Tests Prove Superiority of Mica Wrapped Coils!

"Life of mica-wrapped coils is approximately ten times that of coils using treated cloth wrappers"; so says Mr. L. B. Schmerber, engineer, Westinghouse Electric & Mfg. Co., in a recent article. "Temperatures encountered in rotating electrical apparatus do not affect mica . . . armature insulation is greatly improved by the use of mica on conductors, and mica wrappers for ground insulation."

His tests furnish conclusive proof of the outstanding advantages of mica tape for insulating motors, generators and other electrical machines designed for severe service or special operating conditions involving higher temperatures than ordinarily encountered. Longer life and better, more dependable electrical machines result.

New manufacturing methods have been perfected by the Mica Insulator Co., resulting in a uniform layering of mica that assures a mica tape of unvarying high quality. More than this, the process has made possible a generous reduction in price.

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Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

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Color *that is more than* Skin Deep

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MERIDEN, CONN.

Belden Mfg. Co., 2310B S. Western Ave., Chicago C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. .. R ..
Braidite. See Cornish Wire Co.
Bronvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. C ...
Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C ...
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C ...
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C ...
Cupron. See Gilby Wire Co.
Daron Mfg. Co., 101 Bradford, Providence, R. I. C ...
Detroit Insulated Wire Co., Detroit, Mich. C ...
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. .. R ..
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa. .. ...
Gilby Wire Co., Riverside Ave., Newark, N. J. ... R ..
Goldmark Co., James, 83 Warren, New York.. C ...
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) C ...
Hoskins Mfg. Co., Detroit, Mich. .. R ..
Hudson Wire Co., Ossining, N. Y. C R ..
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. C .. S
Indiana Steel & Wire Co., Muncie, Ind. .. .. S
Inland Wire & Cable Co. Sycamore, Ill. C ...
Ironium Products Co., 112 Hamilton, Cleveland, O. .. R ..
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C ...
Monarch Elec. & Wire Co., 622 W. Adams, Chicago C .. S
Monax. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark.. .. R ..
Nehring Electrical Works, De Kalb, Ill. C ...
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. .. S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. C ...
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C ...
Raco. See Ross Wire Co.
Roebling's Sons Co., John A., Trenton, N. J. C .. S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. C ...
Ross Wire Co., 69 Bath, Providence, R. I. C ...
Selcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. .. .. S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. C ...
Standard Alloy Wire Co., Elizabeth, N. J. .. R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. C ...
Super-Insulated Wire Co., Plymouth, Mass. C ...
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C ...

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

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American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Con..

WIRE, Insulated

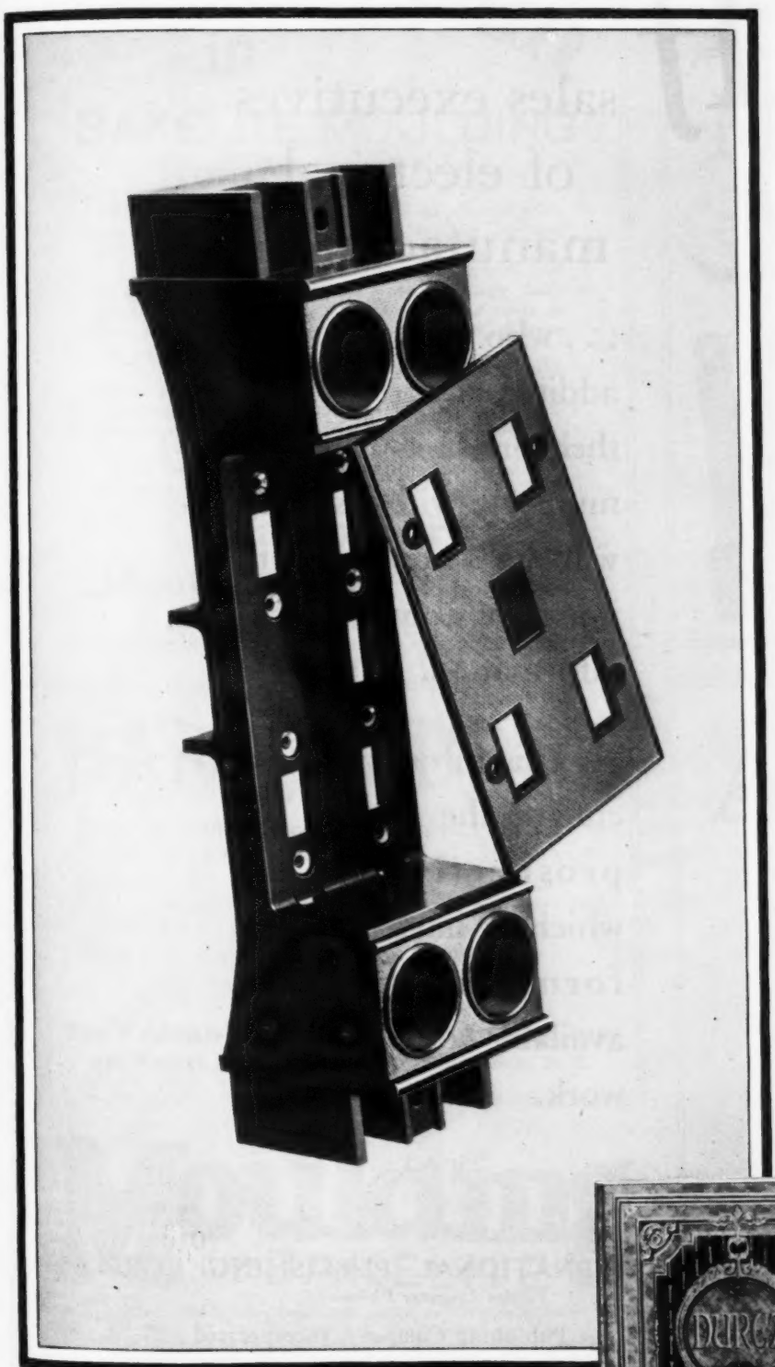
KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord.....See H
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See R
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See R
Lamp Cord .....See R
Magnet Wire .....See M
Rubber Covered Wire & Cable..See R
Stove Wire .....See H
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R .....
A-I Brand. See American Insulated.
Acme Wire Co., New Haven, Conn. Enamaled Silk, Cotton ..... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. ..... A .. M ..
American Copper Products Corp., 233 Broadway, New York, N. Y. .....
American Electrical Works (Philipsdale), Providence, R. I. ..... M
American Enameled Magnet Wire Co., Muskegon, Mich. ..... M
American Fabric Co., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Insulated Wire & Cable Co., 954 W. 21st, Chicago, Ill. ..... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.

Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled ..... A .. M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R .....
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F .....
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H .....
Bradford, Kyle & Co., Plymouth, Mass. ..... M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H .....
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R .....
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Daron Mfg. Co., 101 Bradford, Providence, R. I. ..... R .....
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R ..... T ..
Diamond Braiding Mills, Chicago Heights R F H .....
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R .. H .....
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. ..... M
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R .....
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. ..... F .....
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. ..... T ..
General Asbestos & Rubber Co., Charleston, S. C. ..... H .....
General Elec. Co., Bridgeport, Conn.... R F H .....
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet ..... A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R ..... T ..
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y. ..... R .....
Hatfield Rubber Wks., Inc., Hillside, N. J. R .. H .....
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. R F .. A ..... M
Hercules Powder Co., Wilmington, Del.. ..... A .. M
Holyoke Co., 621 Broadway, New York.. R ..... M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H .....
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R ..... M
Kilo, Co., 2 E. 23d, New York..... ..... T M
Koelle, Frederic C., Real Estate Trust Bldg., Philadelphia, Pa. ..... T ..
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H .....
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. ..... R ..... T ..
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled ..... M
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass. ..... M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill. ..... A ....
Montgomery Co., J. R., Windsor Locks, Conn. ..... T ..
National India Rubber. See U. S.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa..... R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass.. R .. H .. T ..
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R .....
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J. ..... R .....
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F .....
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paradiez. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. ..... H A T ..
Phillips Wire Co., Pawtucket, R. I..... R .....
Providence Insulated Wire Co., Providence, R. I. ..... R F H A .....
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. ..... R .. H .. T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. ..... M
Rome Wire Co., Rome, N. Y. ..... R F H .. T M
Ross Wire Co., 69 Bath, Providence, R. I.. R .....
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. ..... T ..
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H .....
Salamander. See York Insulated.
Sewart Wire Co., Parkersburg, W. Va. R .....
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F .....
Shield. See Ansonia Elec'l Co.
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. .... H .....
Standard Insulated Wire Co., Westfield, Mass. ..... R .. H .....

And a tool has not touched it



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Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R .. ..
Strand & Sweet Mfg. Co., Winsted, Conn. .. .. M
Super-Insulated Wire Co., Plymouth, Mass. .. .. M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R .. ..
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F .. ..
United States Rubber Co., 1790 Broadway, New York, N. Y..... R .. H A T ..
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H .. T ..
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R .. H .. .. M

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American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

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(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines .....See A
Braiding Machines .....See B
Bunching Machines .....See S
Covering Machines .....See I
Insulating Machines .....See I
Insulation Straining Machines.....See I
Measuring Machines .....See M
Park Cabling Machines.....See A
Saturating Tanks .....See F
Spooling Machines .....See U
Stranding Machines .....See S
Tinning Tanks .....See F
Winding Reels .....See U

Adamson Machine Co., Akron, Ohio.. I A .. ..
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A .. .. S U F
Breguet. See American Insulating Machy.
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. .... M .. U ..
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I .. .. U ..
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. .. .. .. M .. U ..
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U ..
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I .. ..
Sleeper & Hartley, Inc., Worcester, Mass. .... A .. .. S U
Terkelson Machine Co., 326 A St., Boston, Mass. .... M .. .. ..
Textile Machine Works, Reading, Pa. .. .. B .. ..
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn..... .. A .. .. .. U F
Utility Mfg. Co., Cudahy, Wis..... I .. ..
Wardwell Braiding Machine Co., Central Falls, R. I..... .. .. B .. ..
Wire Machinery Corp. of Am., New Haven, Conn. .... M S U ..
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

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Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire
WIRE VULCANIZING MACHINES. See Vulcanizers, Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.
WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

YARN AND THREAD; Silk, Cotton, Asbestos

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Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville, Inc., New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

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Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin Grasselli Chemical Co.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co. 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Mattiessen & Hegeles Zinc Co., La Salle, Ill.
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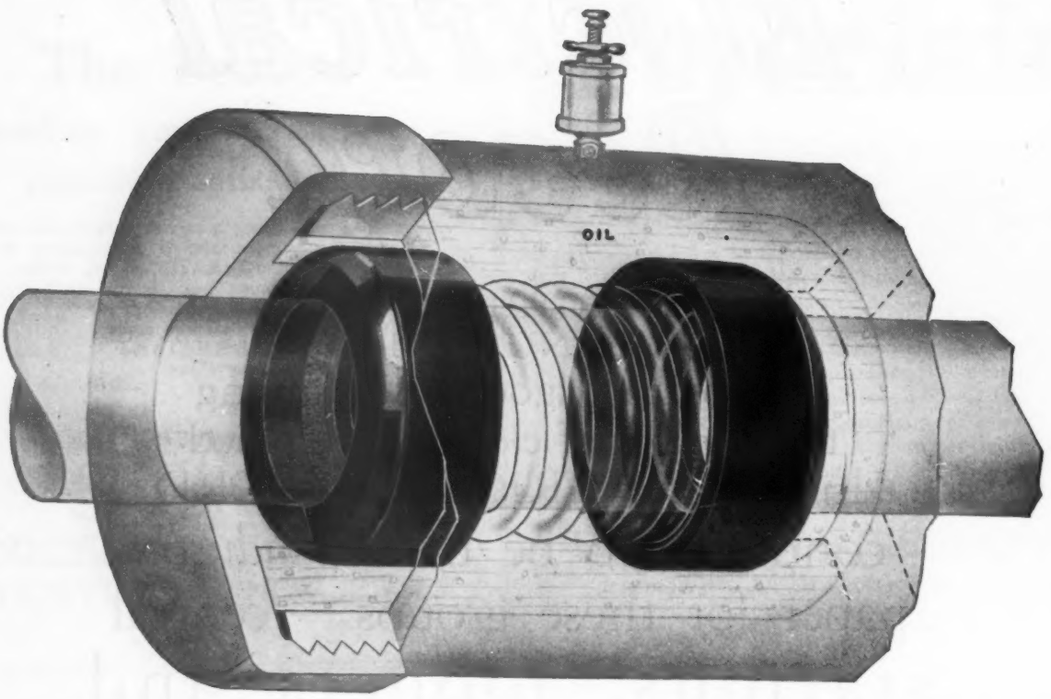

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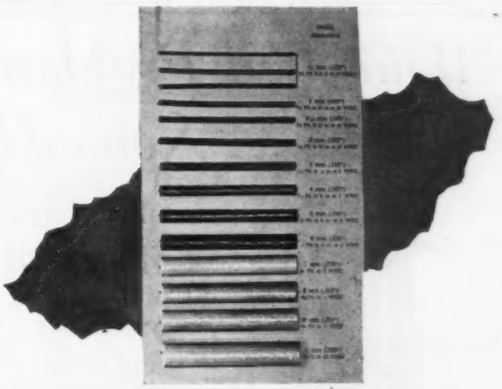

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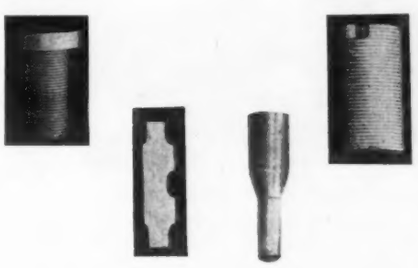

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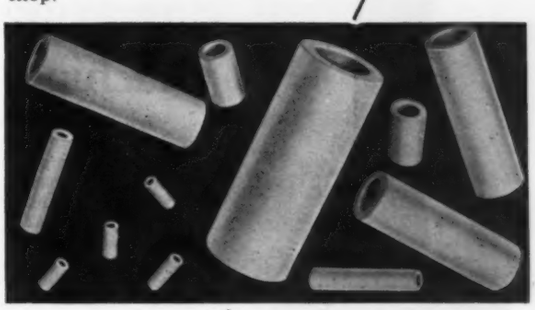

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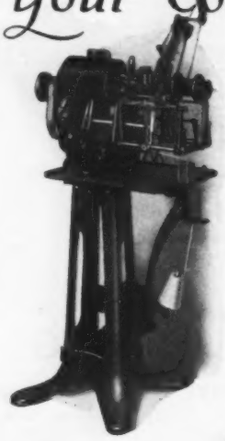

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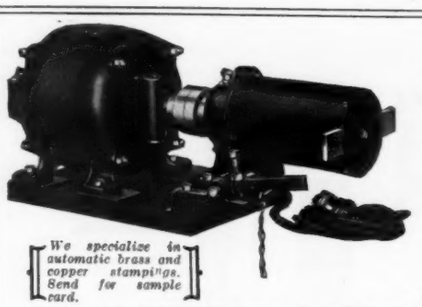

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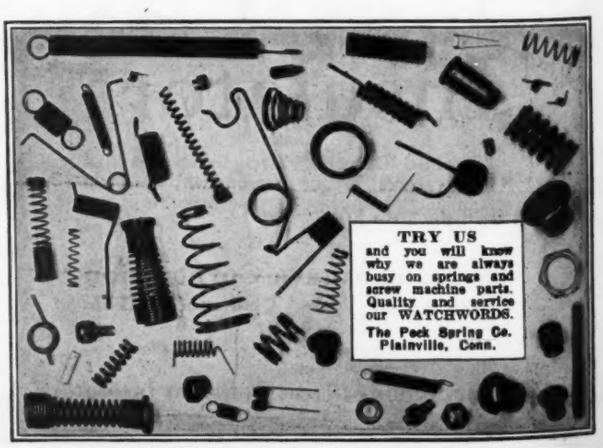
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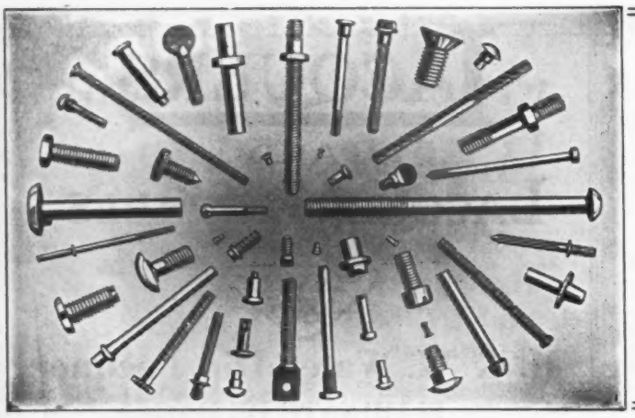

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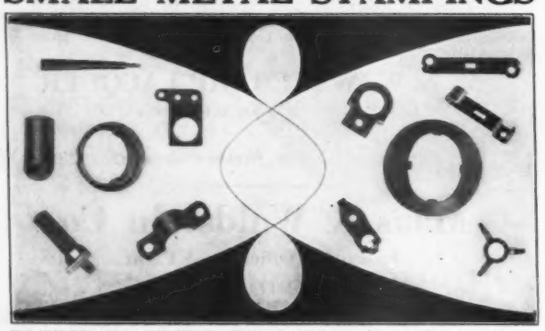

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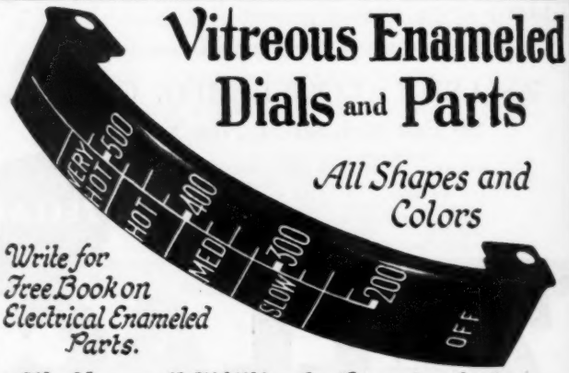

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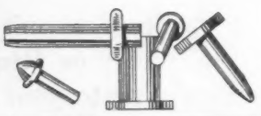

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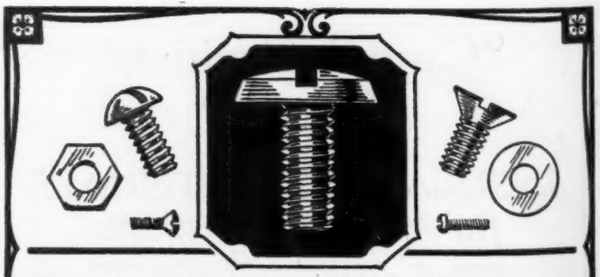

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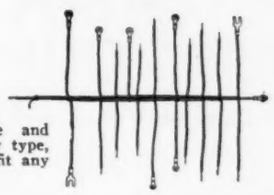

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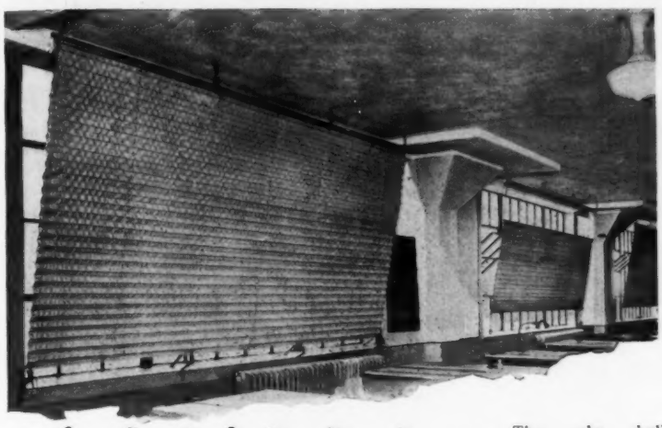
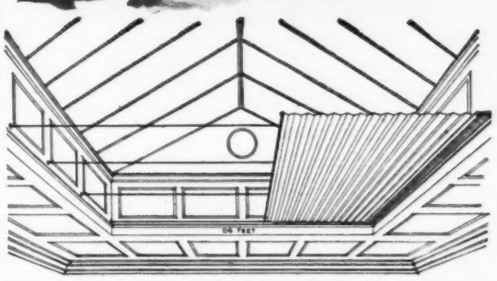
Athey Window Shades

Ideal for Electrical Manufacturers





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Index to Advertisers

Akron Porcelain Company, The. 60
Aluminum Company of America, 27, 53
American Brass Company, The. 64
American Insulator Corporation.. 22
American Lava Corporation..... 63
American Mechanical Labs., Inc. 67
American Radio Hardware Company 42
Anchor Webbing Co..... 39
Ankenbrandt, J. J..... 45
Athey Company 69

Baker & Company, Inc..... 40
Baumbach Mfg. Co., E. A..... 49
Bead Chain Mfg. Company, The. 60
Belden Mfg. Company, Inside Front Cover
Brand & Company, William.... 63
Brandywine Fibre Products Company 33
Brawley, T. R. 39
Brown-Brockmeyer Co., Inc., The 47
Bryant Electric Company, The.. 13
Burgess & Company..... 53

Campbell Fibre Company..... 39
Candy & Company, Inc..... 65
Case Brothers, Inc..... 63
Chandler Company, The..... 36
Chapman Elecl. Wks., P. E.... 47
Chicago Mica Company..... 35
Clark Metal Products, Inc..... 68
Cochrane Chemical Co..... 54
Coffin Mfg. Company, B. F..... 49
Coilton Electric Mfg. Co..... 28
Colasta Co., The..... 12
Collyer Insulated Wire Company 67
Colonial Insulator Company.... 60
Colonial Mica Co..... 34
Connecticut Molded Products Corp., The 56
Consumers Rubber Co., The.... 28
Container Corp. of America..... 29
Continental Fibre Company, The. 37
Cooke Seal Ring Company..... 62

Davis Slate & Mfg. Company... 46
Delaware Hard Fibre Company Outside Back Cover
Delbee Rubber Company..... 69
De Luxe Sales & Mfg. Company 67
Dolph Company, John C..... 36
Dudlo Mfg. Co..... 11
Dunn, J. Struthers 43

Electrical Record 53, 61
Electrical Refractories Co., The.. 63

Electrical Testing Labs..... 47
Fibroc Insulation Co..... 31
Fischer Spring Co., The Chas. 48, 52
Formica Insulation Company, The 4

Gage Inter'nal Publishing Corp..58
Gair Co., Robert.....7-8-9-10
Garfield Mfg. Company..... 34
General Chromium Corp.....19-20
General Plastics, Inc..... 57
General Electric Company....21, 41
Gerdau Company, The, Otto.... 34
Gilby Wire Company..... 54
Gilmer Co., L. H..... 17
Gorton Machine Co., George.... 64

Hardy Metal Corporation..... 40
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Inc..... 16

Impervious Varnish Co..... 36
Industrial Heater Company..... 54
International Insulating Corp... 51

Kendrick & Davis Company.... 45
Kuhn & Jacob Machine & Tool Co. 59

Lee Spring Co., Inc..... 69
Lincoln Fibre & Specialty Co... 33
Linden & Company..... 44

Maas & Waldstein Company.... 65
Manchester Mfg. Company, Inc. 59
Maring Wire Company 68
Massachusetts Machine Shop, Inc. 66
Mercer Porcelain Co., Inc..... 40
Merwin Mfg. Company, Inc..... 66
Mica Insulator Company..... 55
Mid-West Box Company..... 29
Mitchell-Rand Mfg. Company... 65

National Electric Controller Co.. 47
National Vulcanized Fibre Company 24
New Departure Mfg. Company, The 23
New England Screw Company.. 66
Norma-Hoffmann Bearings Corp., Front Cover
Norton Laboratories, Inc..... 34

Ohio Elec. & Controller Co., The 45
Ohmite Mfg. Co..... 44
Olson Mfg. Company..... 44

Parker-Kalon Corp., Inside Back Cover
Patton-MacGuyer Company..... 66
Peck Spring Company, The.... 64
Platt Brothers & Company, The. 49
Portland-Monson Slate Co..... 46
Powell, F. W. 30
Progressive Mfg. Company, The 66

Quadriga Mfg. Company, The.. 66

Recto Mfg. Co. 36
Robbins & Myers Company, Inc. 43
Rogers Fibre Company..... 33
Rogers Paper Mfg. Co., The.... 59
Rome Electrical Company, Inc.. 68
Ruby Chemical Co., The..... 46

Sargent, Lester L..... 38
Scranton Button Company, The, 14-15
Sears, Henry D..... 68
Shakeproof Lock Washer Company, Inc. 70
Shaw Insulator Company 34
Sherman Mfg. Company, H. B.. 39
Sorgel Electric Company..... 45
Star Porcelain Company, The... 60
Sunlight Electrical Mfg. Co.... 43

Thomaston Mfg. Co..... 53
Timken Roller Bearing Company, The 3
Trotter & Company, E. T..... 65

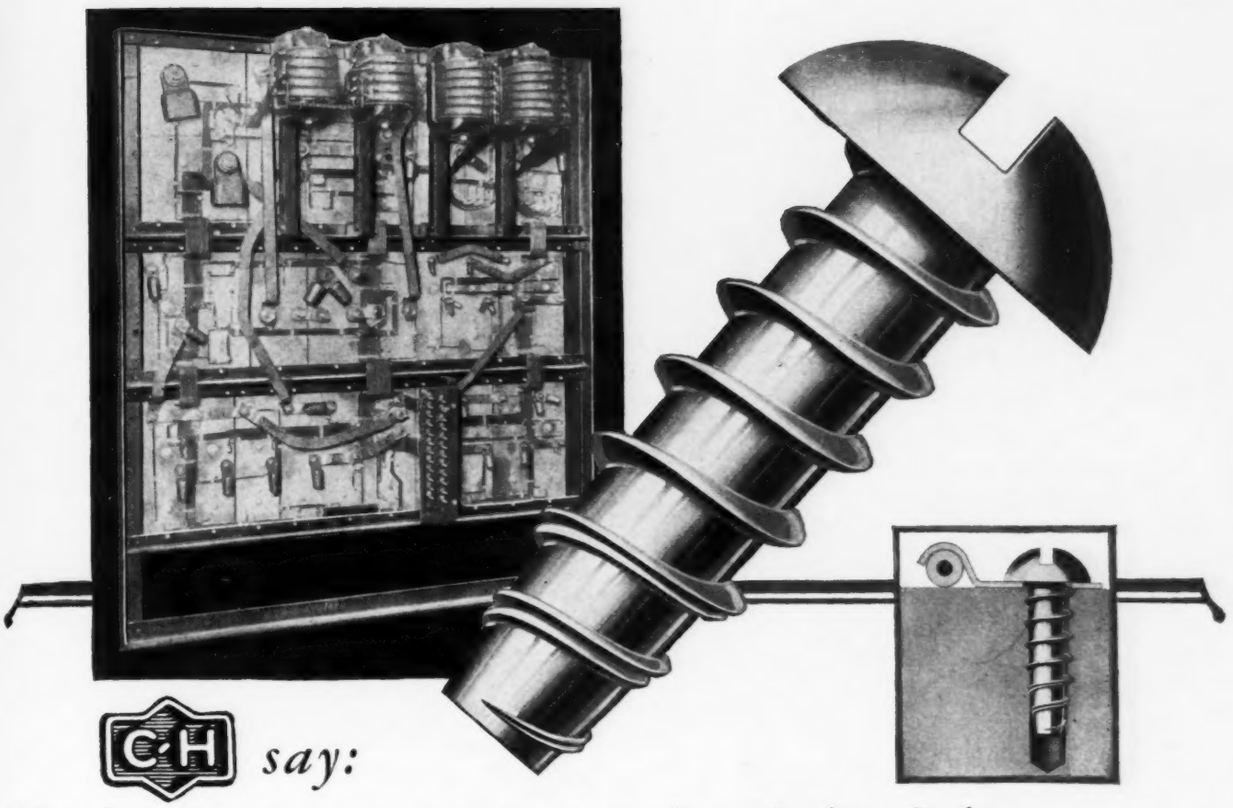
Udylite Process Co.....19-20
Union Electric Mfg. Company.. 45
Universal Winding Company.... 64

Vulcanized Rubber Co., Inc., The 59

Ward Leonard Electric Company. 18
Waterbury Button Company.... 59
Waukegan Chemical Company... 38
Weston Elec'l Instrument Corporation 47
Whittier Company, The Horace R. 66
Wilmington Fibre Specialty Co. 37

York Insulated Wire Wks. of G. E. Co..... 6

Zeller Lacquer Mfg. Company.. 65
Zierick Machine Works, F. R... 64



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Sheet Metal Screws

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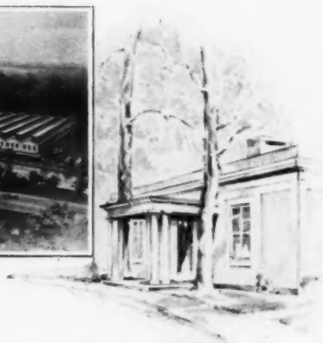

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